

GENERAL NOTES

CODE AND STANDARDS

1. ALL WORK SHALL COMPLY WITH 2017 NATIONAL ELECTRIC CODE (NEC), 2018 NORTH CAROLINA BUILDING CODE (NCBC), 2018 NORTH CAROLINA RESIDENTIAL CODE (NCRC), PLUMBING CODE (NPC), AND ALL STATE AND LOCAL BUILDING, ELECTRICAL, AND PLUMBING CODES.
2. DRAWINGS HAVE BEEN DETAILED ACCORDING TO UL LISTING REQUIREMENTS.

SITE NOTES / OSHA REGULATION

1. A LADDER SHALL BE IN PLACE FOR INSPECTION IN COMPLIANCE WITH OSHA REGULATIONS.
2. THE PV MODULES ARE CONSIDERED NON-COMBUSTIBLE AND THIS SYSTEM IS A UTILITY INTERACTIVE SYSTEM.
3. THE SOLAR PV INSTALLATION SHALL NOT OBSTRUCT ANY PLUMBING, MECHANICAL, OR BUILDING ROOF VENTS.
4. ROOF COVERINGS SHALL BE DESIGNED, INSTALLED, AND MAINTAINED IN ACCORDANCE WITH THIS CODE AND THE APPROVED MANUFACTURER'S INSTRUCTIONS SUCH THAT THE ROOF COVERING SHALL SERVE TO PROTECT THE BUILDING OR STRUCTURE.

SOLAR CONTRACTOR

1. MODULE CERTIFICATIONS WILL INCLUDE UL1703, IEC61646, IEC61730.
2. IF APPLICABLE, MODULE GROUNDING LUGS MUST BE INSTALLED AT THE MARKED GROUNDING LUG HOLES PER THE MANUFACTURER'S INSTALLATION REQUIREMENTS.
3. AS INDICATED BY DESIGN, OTHER NRTL LISTED MODULE GROUNDING DEVICES MAY BE USED IN PLACE OF STANDARD GROUNDING LUGS AS SHOWN IN MANUFACTURER DOCUMENTATION AND APPROVED BY THE AHJ.
4. CONDUIT AND WIRE SPECIFICATIONS ARE BASED ON MINIMUM CODE REQUIREMENTS AND ARE NOT MEANT TO LIMIT UP-SIZING AS REQUIRED BY FIELD CONDITIONS.
5. CONDUIT POINT OF PENETRATION FROM EXTERIOR TO INTERIOR TO BE INSTALLED AND SEALED WITH A SUITABLE SEALING COMPOUND.
6. DC WIRING LIMITED TO MODULE FOOTPRINT W/ ENPHASE AC SYSTEM.
7. ENPHASE WIRING SYSTEMS SHALL BE LOCATED AND SECURED UNDER THE ARRAY W/ SUITABLE WIRING CLIPS.
8. MAX DC VOLTAGE CALCULATED USING MANUFACTURER PROVIDED TEMP COEFFICIENT FOR VOC UNLESS NOT AVAILABLE.
9. ALL INVERTERS, MOTOR GENERATORS, PHOTOVOLTAIC MODULES, PHOTOVOLTAIC PANELS, AC PHOTOVOLTAIC MODULES, DC COMBINERS, DC-TO-DC CONVERTERS, SOURCE CIRCUIT COMBINERS, AND CHARGE CONTROLLERS INTENDED FOR USE IN A PHOTOVOLTAIC POWER SYSTEM WILL BE IDENTIFIED AND LISTED FOR THE APPLICATION PER NEC 690.4(B).
10. ALL SIGNAGE TO BE PLACED IN ACCORDANCE WITH LOCAL BUILDING CODE.
11. TERMINALS AND LUGS WILL BE TIGHTENED TO MANUFACTURER TORQUE SPECIFICATIONS (WHEN PROVIDED) IN ACCORDANCE WITH NEC CODE 110.14(D) ON ALL ELECTRICAL CONNECTIONS.

EQUIPMENT LOCATIONS

1. PROPER ACCESS AND WORKING CLEARANCE AROUND EXISTING AND PROPOSED ELECTRICAL EQUIPMENT WILL BE PROVIDED AS PER SECTION NEC 110.26.
2. EQUIPMENT INSTALLED IN DIRECT SUNLIGHT MUST BE RATED FOR EXPECTED OPERATING TEMPERATURE AS SPECIFIED BY NEC 690.31(A) AND NEC TABLE 310.15(B).
3. ALL EQUIPMENT SHALL BE INSTALLED ACCESSIBLE TO QUALIFIED PERSONNEL ACCORDING TO NEC APPLICABLE CODES.
4. ALL COMPONENTS ARE LISTED FOR THEIR PURPOSE AND RATED FOR OUTDOOR USAGE WHEN APPROPRIATE.

PROJECT INFORMATION:

NUMBER OF STORIES: 2
CONDUIT RUN: Exterior
ECOBEE QTY: 0
LIGHT BULB QTY: 18
PV METER: Not Required

ROOF TYPE (1) INFORMATION:

ROOF TYPE: Comp Shingle
FRAMING TYPE: Manufactured Truss
SHEATHING TYPE: OSB
ATTACHMENT: SFM Infinity Flashkit
RACKING: Unirac SFM Infinity @ 48" OC Portrait / 72" OC Landscape
NUMBER OF ATTACHMENTS: 48

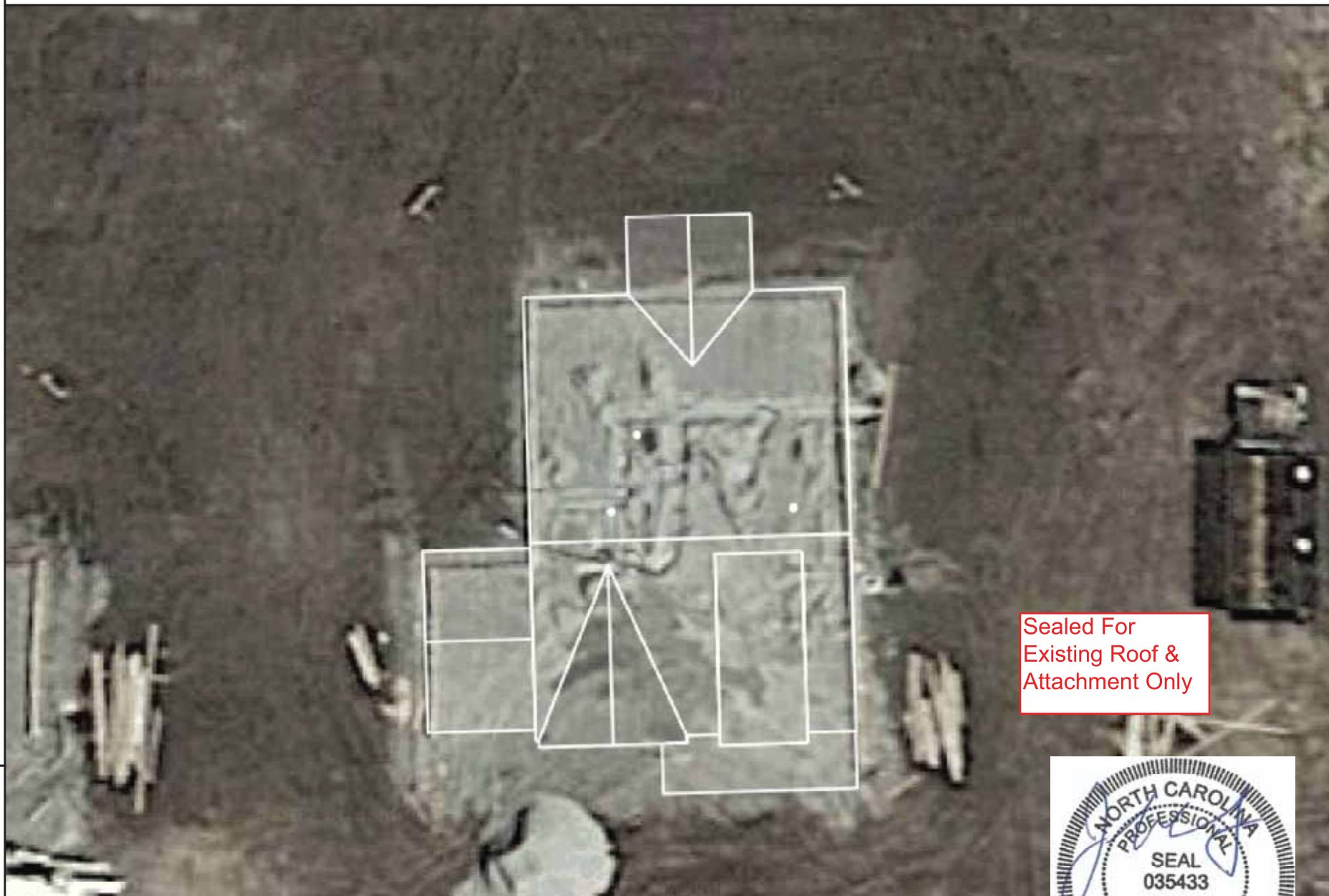
ROOF TYPE (2) INFORMATION (IF APPLICABLE):

***SEE PV4.2**

SYSTEM TO BE INSTALLED INFORMATION:

DC SYSTEM SIZE: 7.695 kW DC
AC SYSTEM SIZE: 5.51 kW AC
MODULE TYPE: (19) Seraphim SEG-405-BMD-TB
INVERTER TYPE: Enphase IQ8PLUS-72-2-US
MONITORING: Enphase IQ Combiner 4 X-IQ-AM1-240-4

AERIAL VIEW



DESIGN CRITERIA

WIND SPEED: 115 mph
GROUND SNOW LOAD: 15 lb/ft²
WIND EXPOSURE FACTOR: C
SEISMIC DESIGN CATEGORY: B

SITE SPECIFICATIONS

CONSTRUCTION - V-B
ZONING: RESIDENTIAL

SCOPE OF WORK

INSTALLATION OF UTILITY INTERACTIVE PHOTOVOLTAIC SOLAR SYSTEM AND ANY NECESSARY ADDITIONAL WORK NEEDED FOR INSTALLATION.

SHEET INDEX

PV1 - COVER SHEET
PV2 - SITE PLAN
PV3 - ROOF PLAN
PV4 - STRUCTURAL
PV5 - ELECTRICAL 3-LINE DIAGRAM
PV6 - ELECTRICAL CALCULATIONS
PV7 - WARNING LABELS AND LOCATIONS 7/31/23
(ALL OTHER SHEETS AS REQUIRED)
SS - PRODUCT SPEC. SHEETS

Firm No. : D-0449

UTILITY COMPANY:

Duke Energy NC

PERMIT ISSUER:

Harnett County

Digitally signed
 by John A. Calvert
 Date: 2023.07.31
 15:00:32 -06'00'



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PV INSTALLATION PROFESSIONAL

Scott Gurney
 #PV-011719-015866

CONTRACTOR:
 BRS FIELD OPS
 800-377-4480

CUSTOMER INFORMATION:

Daniel Morgan
 226 josey williams road
 arwin North Carolina 28339
AC SYSTEM SIZE: 5.51 kW AC
DC SYSTEM SIZE: 7.695 kW DC

DRAWING BY:

Cordell Lawson

PLOT DATE:

July 31, 2023

PROJECT NUMBER:

748461

SHEET NAME:

COVER SHEET

REVISION:

A

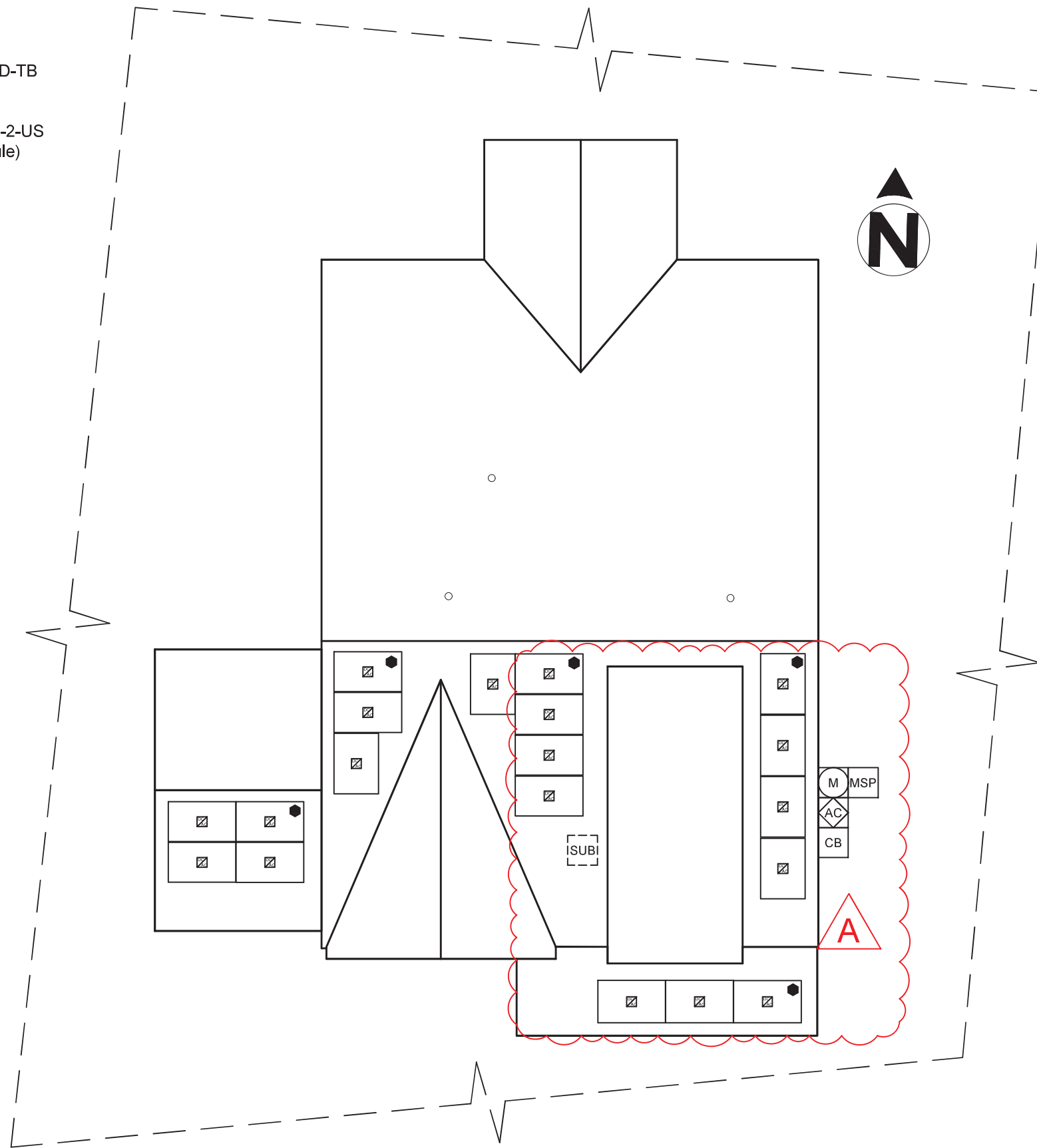
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PV1

PV SYSTEM SPECIFICATIONS
















TOTAL NUMBER OF MODULES: 19
MODULE MAKE AND MODEL: Seraphim SEG-405-BMD-TB
MODULE WATTAGE: 405W DC

INVERTER MAKE AND MODEL: Enphase IQ8PLUS-72-2-US
INVERTER TYPE: Microinverter (1 Inverter per PV Module)
INVERTER CURRENT OUTPUT: 1.21A AC
INVERTER NOMINAL VOLTAGE: 240V
INVERTER WATTAGE: 290W AC



FRONT OF HOME
 226 JOSEY WILLIAMS ROAD

LEGEND

-  JUNCTION BOX
-  UTILITY METER
-  MAIN SERVICE PANEL
-  AC DISCONNECT
-  COMBINER BOX
-  LOAD CENTER
-  SUBPANEL
-  PV METER
-  TRANSFER SWITCH
-  SUNPOWER ESS
-  SUNPOWER HUB+
-  REMOTE POWER OFF
-  FIRE SETBACK
-  TRENCHING
-  PROPERTY LINE

SCALE: 3/32" = 1'-0"

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Existing Roof &
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7/31/23

Firm No. : D-0449



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 226 Josey Williams Road
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DC SYSTEM SIZE: 7.695 kW DC

DRAWING BY:

Cordell Lawson

PLOT DATE:

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SHEET NAME:

SITE PLAN

REVISION:

A

PAGE NUMBER:

PV2

PV SYSTEM SPECIFICATIONS
TOTAL NUMBER OF MODULES: 19
MODULE MAKE AND MODEL: Seraphim SEG-405-BMD-TB
MODULE WATTAGE: 405W DC

INVERTER MAKE AND MODEL: Enphase IQ8PLUS-72-2-US
INVERTER TYPE: Microinverter (1 Inverter per PV Module)
INVERTER CURRENT OUTPUT: 1.21A AC
INVERTER NOMINAL VOLTAGE: 240V
INVERTER WATTAGE: 290W AC

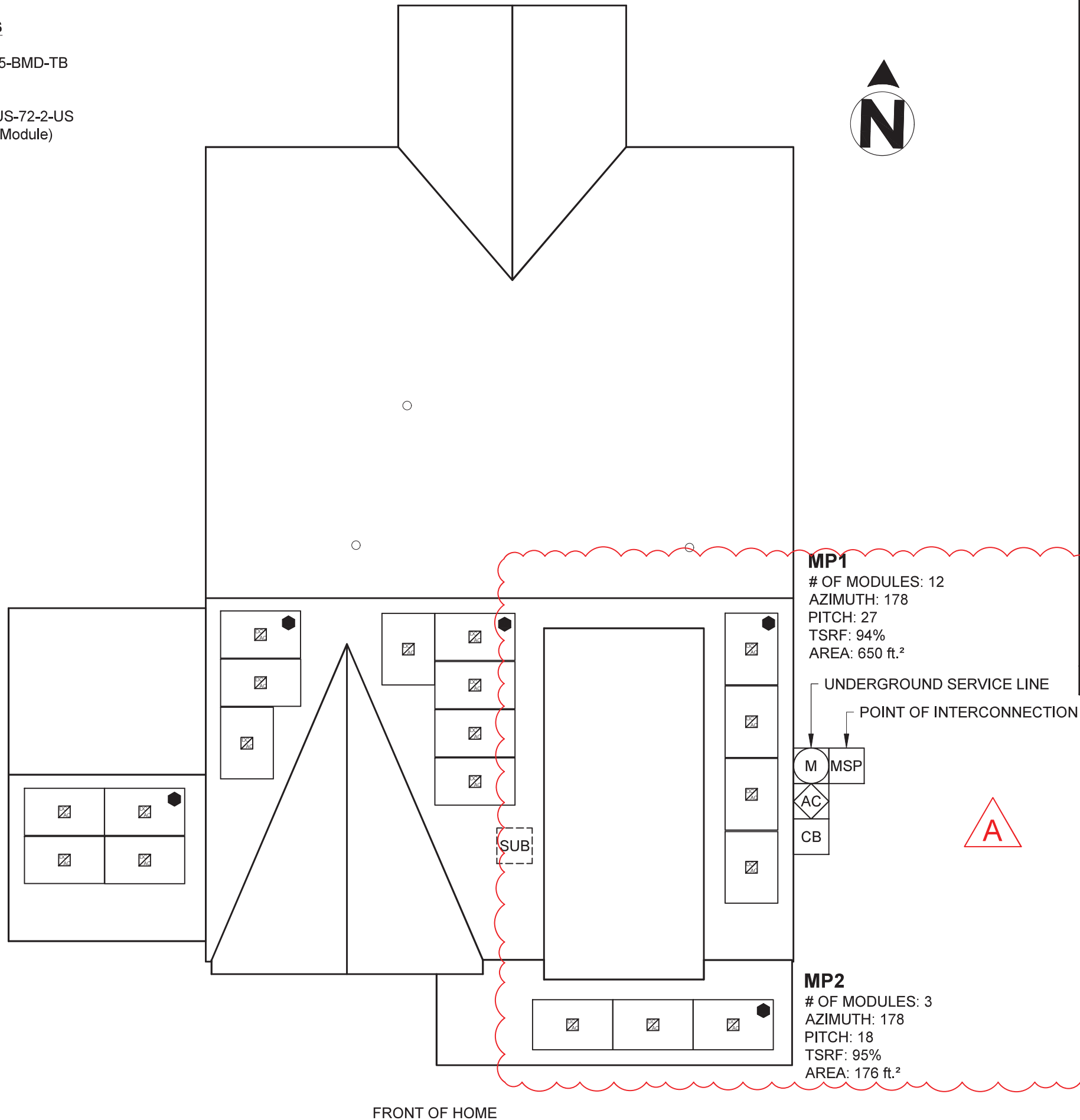
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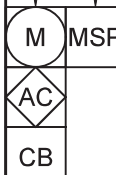
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MP3
OF MODULES: 4
AZIMUTH: 178
PITCH: 27
TSRF: 94%
AREA: 157 ft.²



MP1
OF MODULES: 12
AZIMUTH: 178
PITCH: 27
TSRF: 94%
AREA: 650 ft.²

UNDERGROUND SERVICE LINE
 POINT OF INTERCONNECTION



MP2
OF MODULES: 3
AZIMUTH: 178
PITCH: 18
TSRF: 95%
AREA: 176 ft.²

FRONT OF HOME

DC SYSTEM SIZE: 7.695 KW DC
 MODULE: SEG 405
 INVERTER(S): ENPHASE IQ8+ MICROINVERTERS

LEGEND

- JUNCTION BOX
- UTILITY METER
- MAIN SERVICE PANEL
- AC DISCONNECT
- COMBINER BOX
- LOAD CENTER
- SUBPANEL
- PV METER
- TRANSFER SWITCH
- SUNPOWER ESS
- SUNPOWER HUB+
- REMOTE POWER OFF
- FIRE SETBACK
- TRENCHING
- PROPERTY LINE

SCALE: 1/8" = 1'-0"



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PV INSTALLATION
 PROFESSIONAL
 Scott Gurney
 #PV-011719-015866

CONTRACTOR:
 BRS FIELD OPS
 800-377-4480

CUSTOMER INFORMATION:
 Daniel Morgan
 226 josey williams road
 arwin North Carolina 28339

AC SYSTEM SIZE: 5.51 kW AC
DC SYSTEM SIZE: 7.695 kW DC

DRAWING BY:

Cordell Lawson

PLOT DATE:

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PROJECT NUMBER:

748461

SHEET NAME:

ROOF PLAN

REVISION:

A

PAGE NUMBER:

PV3

STRUCTURAL INFORMATION:

ROOF TYPE (1):
ROOF TYPE: Comp Shingle
SHEATHING TYPE: OSB
FRAMING TYPE: Manufactured Truss
FRAMING SIZE: 2x6 @ 24" OC
CEILING JOIST SIZE: 2x6 @ 24" OC

ATTACHMENT: SFM Infinity Flashkit
RACKING: Unirac SFM Infinity
 @ 48" OC Portrait / 72" OC Landscape

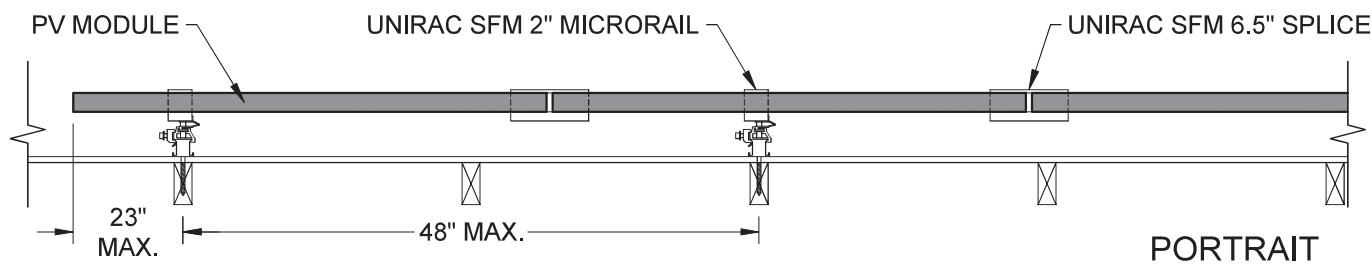
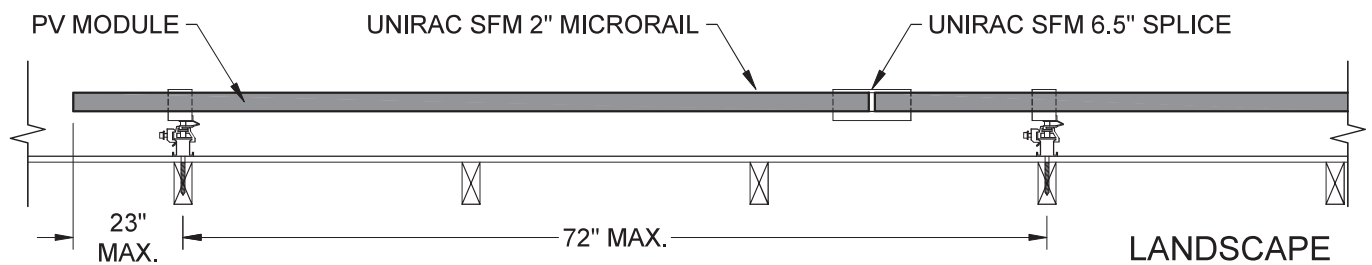
NUMBER OF ATTACHMENTS: 48

PV MODULE COUNT: 19 Modules
TOTAL ARRAY AREA: 387.6 ft² (20.4ft²/panel)
TOTAL ROOF AREA: 3446 ft²
ARRAY/ROOF AREA: 11.2%
ARRAY WEIGHT: 950 lbs (50 lbs/panel)
DISTRIBUTED LOAD: 2.45 lbs/ft²
POINT LOAD: 19.79 lbs/attachment

STRUCTURAL NOTES:

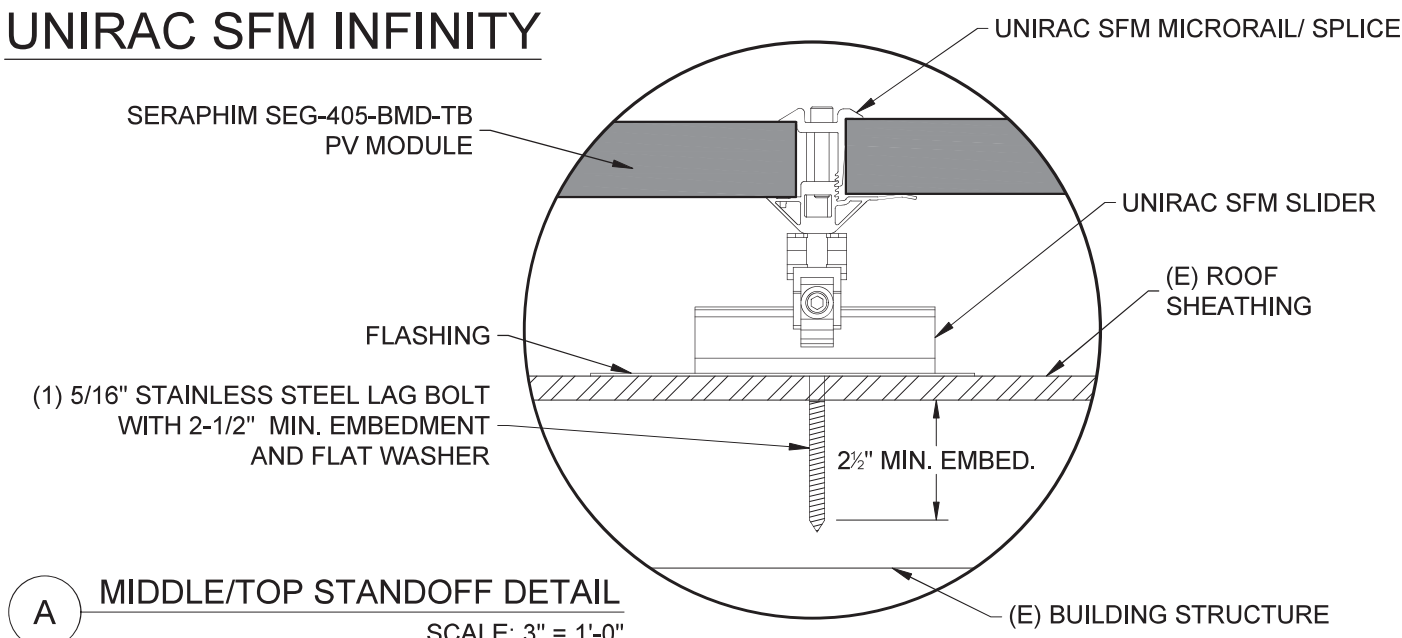
Truss spacing on MP1 is only 12 inches in some areas.

*NOTE: LISTED NUMBER OF ATTACHMENT POINTS ARE AN ESTIMATE ONLY AND MAY VARY BASED ON FIELD CONDITIONS. MAXIMUM ATTACHMENT SPACING TO BE FOLLOWED PER ENGINEER OF RECORD SPECIFICATIONS.

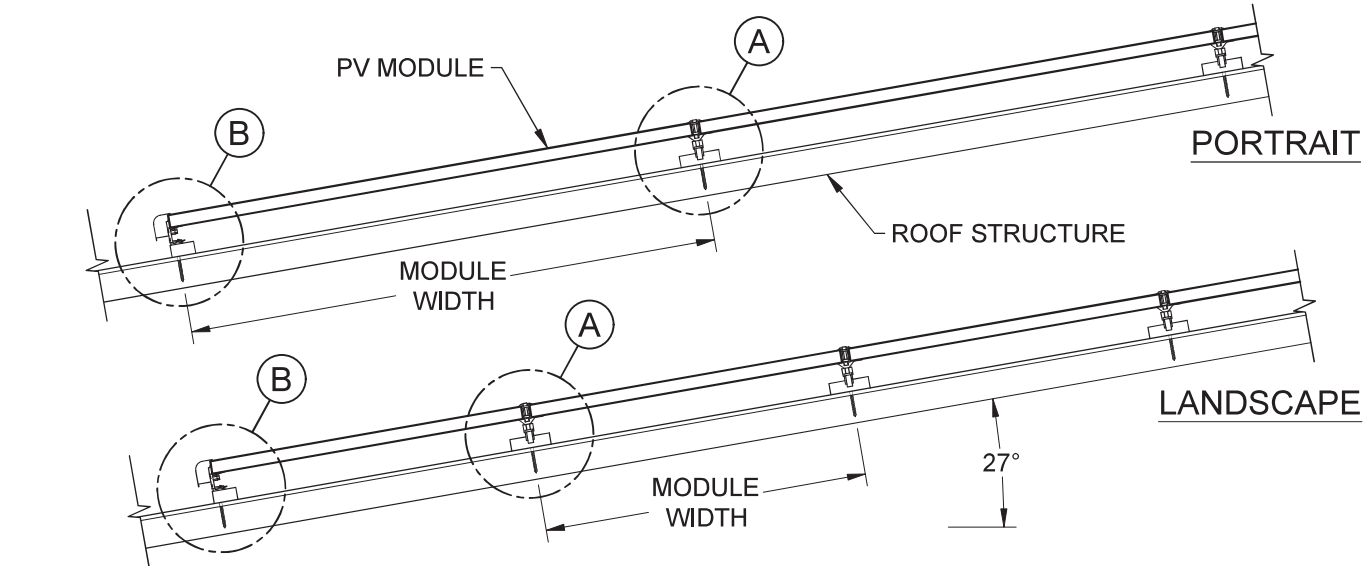


C ATTACHMENT SPACING- FRONT VIEW
 SCALE: 3/4" = 1'-0"
 -RACKING ATTACHMENTS TO BE STAGGERED

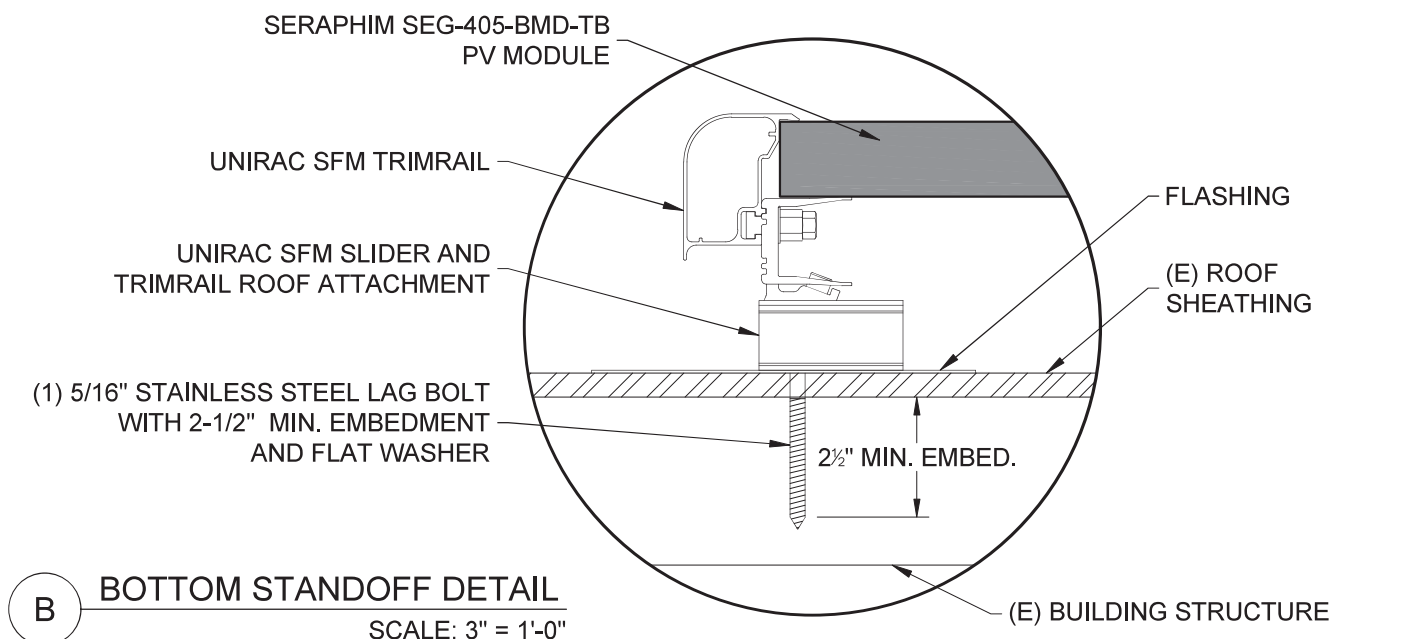
UNIRAC SFM INFINITY



A MIDDLE/TOP STANDOFF DETAIL
 SCALE: 3" = 1'-0"



D ATTACHMENT SPACING- SIDE VIEW
 SCALE: 1/2" = 1'-0"



B BOTTOM STANDOFF DETAIL
 SCALE: 3" = 1'-0"

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CONTRACTOR:
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CUSTOMER INFORMATION:

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 226 josey williams road
 arwin North Carolina 28339
AC SYSTEM SIZE: 5.51 kW AC
DC SYSTEM SIZE: 7.695 kW DC

DRAWING BY:
 Cordell Lawson

PLOT DATE:
 July 31, 2023

PROJECT NUMBER:
 748461

SHEET NAME:
 STRUCTURAL

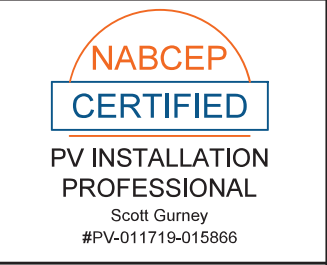
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15	(1) 10 AWG THHN/THWN-2, CU., BLACK (L1)	23.0 A AC	3	(2) 10 AWG THHN/THWN-2, CU., BLACK (L1)	MAX 12.1 A AC	2	(1) 10 AWG THHN/THWN-2, CU., BLACK (L1)	MAX 12.1 A AC	1	(1) 12-2 TC-ER, THHN/THWN-2, CU.	MAX 12.1 A AC
	(1) 10 AWG THHN/THWN-2, CU., RED (L2)	240 V AC		(2) 10 AWG THHN/THWN-2, CU., RED (L2)	240 V AC		(1) 10 AWG THHN/THWN-2, CU., RED (L2)	240 V AC		(1) 6 AWG BARE, CU (EGC)	240 V AC
	(1) 10 AWG THHN/THWN-2, CU., WHITE (N)			(1) 10 AWG THHN/THWN-2, CU., GREEN (EGC)			(1) 10 AWG THHN/THWN-2, CU., GREEN (EGC)				
	(1) 10 AWG THHN/THWN-2, CU., GREEN (EGC)						OR 10- 2 UF-B W/G (OR NM-B), THHN/THWN-2, SOLID CU.				
	(1) 3/4 INCH EMT	EXTERIOR		(1) 3/4 INCH EMT	EXTERIOR		(1) 3/4 INCH EMT (Not Required for UF-B or NM-B Cable)	EXTERIOR			EXTERIOR



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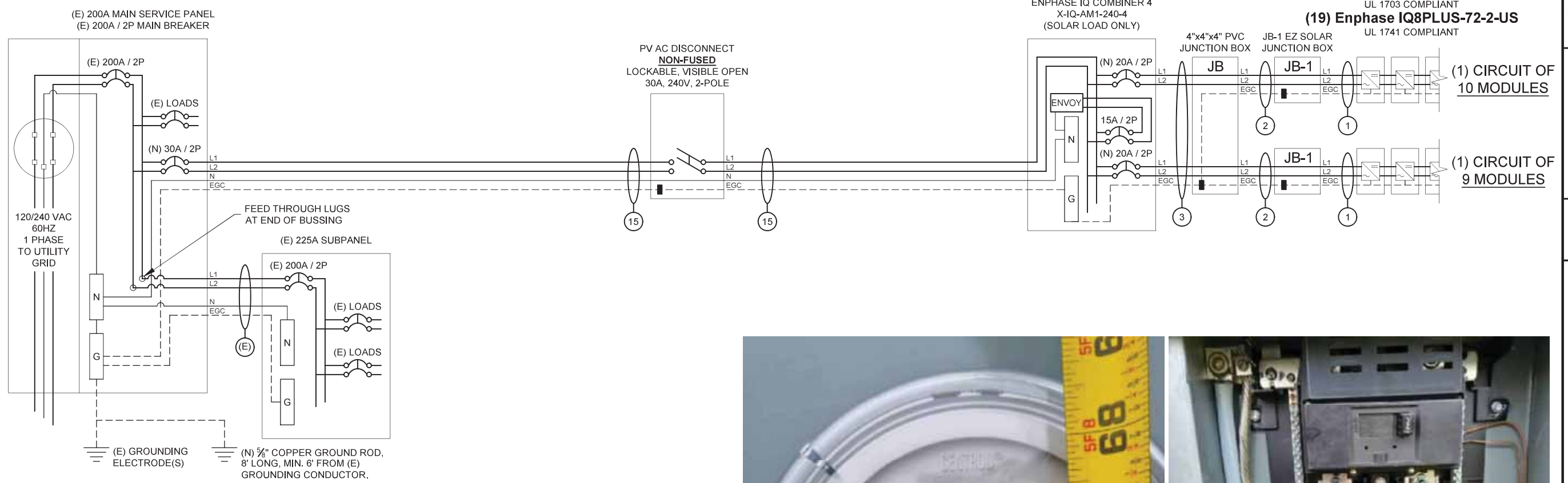
CONTRACTOR:
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DESIGNER NOTES:

LOAD SIDE BREAKER IN MSP. EXTERIOR POI.

ELECTRICAL NOTES:

19 MICROINVERTERS X 290 W AC = 5.51 KW AC;
PANEL WATTAGE = 405 W DC



IF REQUIRED, VERIFICATION WILL BE DONE TO ENSURE THE GROUNDING ELECTRODE SYSTEM IS CONGRUENT WITH CURRENT REQUIREMENTS. (NEC 250 PART III) IF NOT, A NEW GROUND ROD WILL BE INSTALLED.

(E) 225A SUBPANEL
(E) 200A / 2P
(E) LOADS
(N) 30A / 2P
(E) GROUNDING ELECTRODE(S)
(N) 5/8" COPPER GROUND ROD, 8' LONG, MIN. 6' FROM (E) GROUNDING CONDUCTOR.
GEC INSTALLED PER NEC 250.64: 6 OR 4 AWG SOLID COPPER GEC.

INTERCONNECTION NOTES

705.12(B)(3) THE FOLLOWING METHOD(S) SHALL BE USED TO DETERMINE THE RATINGS OF BUSBARS: (6) CONNECTIONS SHALL BE PERMITTED ON BUSBARS OF PANEL-BOARDS THAT SUPPLY LUGS CONNECTED TO FEED-THROUGH CONDUCTORS. THE FEED THROUGH CONDUCTORS SHALL BE SIZED IN ACCORDANCE WITH 705.12(B)(1).



UTILITY COMPANY: Duke Energy NC

PERMIT ISSUER: Harnett County

CUSTOMER INFORMATION:
Daniel Morgan
226 josey williams road
arwin North Carolina 28339
AC SYSTEM SIZE: 5.51 kW AC
DC SYSTEM SIZE: 7.695 kW DC

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SHEET NAME:
ELECTRICAL

REVISION: A
PAGE NUMBER: PV5

MODULE SPECIFICATIONS	Seraphim SEG-405-BMD-TB
RATED POWER (STC)	405 W
MODULE VOC	37.22 V DC
MODULE VMP	30.93 V DC
MODULE IMP	13.1 A DC
MODULE ISC	13.7 A DC
VOC CORRECTION	-0.26 %/°C
VMP CORRECTION	-0.34 %/°C
SERIES FUSE RATING	25 A DC
ADJ. MODULE VOC @ ASHRAE LOW TEMP	40.6 V DC
ADJ. MODULE VMP @ ASHRAE 2% AVG. HIGH TEMP	26.2 V DC

MICROINVERTER SPECIFICATIONS	Enphase IQ8+ Microinverters
POWER POINT TRACKING (MPPT) MIN/MAX	30 - 58 V DC
MAXIMUM INPUT VOLTAGE	60 V DC
MAXIMUM DC SHORT CIRCUIT CURRENT	15 A DC
MAXIMUM USABLE DC INPUT POWER	440 W
MAXIMUM OUTPUT CURRENT	1.21 A AC
AC OVERCURRENT PROTECTION	20 A
MAXIMUM OUTPUT POWER	290 W
CEC WEIGHTED EFFICIENCY	97 %

AC PHOTOVOLTAIC MODULE MARKING (NEC 690.52)	
NOMINAL OPERATING AC VOLTAGE	240 V AC
NOMINAL OPERATING AC FREQUENCY	47 - 68 HZ AC
MAXIMUM AC POWER	240 VA AC
MAXIMUM AC CURRENT	1.0 A AC
MAXIMUM OCPD RATING FOR AC MODULE	20 A AC

DESIGN LOCATION AND TEMPERATURES	
TEMPERATURE DATA SOURCE	ASHRAE 2% AVG. HIGH TEMP
STATE	North Carolina
CITY	arwin
WEATHER STATION	SEYMOUR-JOHNSON AFB
ASHRAE EXTREME LOW TEMP (°C)	-10
ASHRAE 2% AVG. HIGH TEMP (°C)	38

SYSTEM ELECTRICAL SPECIFICATIONS	CIR 1	CIR 2	CIR 3	CIR 4	CIR 5	CIR 6
NUMBER OF MODULES PER MPPT	10	9				
DC POWER RATING PER CIRCUIT (STC)	4050	3645				
TOTAL MODULE NUMBER	19					
STC RATING OF ARRAY	7695					
AC CURRENT @ MAX POWER POINT (IMP)	12.1	10.9				
MAX. CURRENT (IMP X 1.25)	15.125	13.6125				
OCPD CURRENT RATING PER CIRCUIT	20	20				
MAX. COMB. ARRAY AC CURRENT (IMP)	23.0					
MAX. ARRAY AC POWER	5510W AC					

AC VOLTAGE RISE CALCULATIONS	DIST (FT)	COND.	√RISE(V)	VEND(V)	%VRISE
VRISE SEC. 1 (MICRO TO JBOX)	36	12 Cu.	1.45	241.45	0.61%
VRISE SEC. 2 (JBOX TO COMBINER BOX)	65	10 Cu.	2.00	242.00	0.83%
VRISE SEC. 3 (COMBINER BOX TO POI)	5	10 Cu.	0.29	240.29	0.12%
TOTAL VRISE			3.74	243.74	1.56%

PHOTOVOLTAIC AC DISCONNECT OUTPUT LABEL (NEC 690.54)	
AC OUTPUT CURRENT	23.0 A AC
NOMINAL AC VOLTAGE	240 V AC

CONDUCTOR SIZE CALCULATIONS	
MICROINVERTER TO JUNCTION BOX (1)	MAX. SHORT CIRCUIT CURRENT (ISC) = 12.1 A AC MAX. CURRENT (ISC X1.25) = 15.1 A AC CONDUCTOR (TC-ER, COPPER (90°C)) = 12 AWG CONDUCTOR RATING = 30 A AMB. TEMP. AMP. CORRECTION = 0.91 ADJUSTED AMP. = 27.3 > 15.1
JUNCTION BOX TO JUNCTION BOX (2)	MAX. SHORT CIRCUIT CURRENT (ISC) = 12.1 A AC MAX. CURRENT (ISC X1.25) = 15.1 A AC CONDUCTOR (THWN-2, COPPER (75°C TERM.)) = 10 AWG CONDUCTOR RATING = 35 A CONDUIT FILL DERATE = 1 AMB. TEMP. AMP. CORRECTION = 0.91 ADJUSTED AMP. = 31.85 > 15.1
JUNCTION BOX TO COMBINER BOX (3)	MAX. SHORT CIRCUIT CURRENT (ISC) = 12.1 A AC MAX. CURRENT (ISC X1.25) = 15.1 A AC CONDUCTOR (THWN-2, COPPER (75°C TERM.)) = 10 AWG CONDUCTOR RATING = 35 A CONDUIT FILL DERATE = 0.8 AMB. TEMP. AMP. CORRECTION = 0.91 ADJUSTED AMP. = 25.48 > 15.1
COMBINER BOX TO MAIN PV OCPD (15)	INVERTER RATED AMPS = 23.0 A AC MAX. CURRENT (RATED AMPS X1.25) = 28.74 A AC CONDUCTOR (THWN-2, COPPER (75°C TERM.)) = 10 AWG CONDUCTOR RATING = 35 A CONDUIT FILL DERATE = 1 AMB. TEMP. AMP. CORRECTION = 0.91 ADJUSTED AMP. = 31.85 > 28.7



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800-377-4480

GROUNDING NOTES

1. A GROUNDING ELECTRODE SYSTEM IN ACCORDANCE WITH [NEC 690.47] AND [NEC 250.50-60] SHALL BE PROVIDED. PER [NEC 690.47], THE GROUNDING ELECTRODE SYSTEM OF AN EXISTING BUILDING MAY BE USED AND BE BONDED AT THE SERVICE ENTRANCE. IF EXISTING SYSTEM IS INACCESSIBLE, OR INADEQUATE, OR IS ONLY METALLIC WATER PIPING, A SUPPLEMENTAL GROUNDING ELECTRODE WILL BE USED AT THE INVERTER LOCATION CONSISTING OF A UL LISTED 8 FT GROUND ROD WITH ACORN CLAMP.
2. THE GROUNDING ELECTRODE CONDUCTOR SHALL BE PROTECTED FROM PHYSICAL DAMAGE BETWEEN THE GROUNDING ELECTRODE AND THE PANEL (OR INVERTER) IF SMALLER THAN #6 AWG COPPER WIRE PER [NEC 250.64(B)]. THE GROUNDING ELECTRODE CONDUCTOR WILL BE CONTINUOUS, EXCEPT FOR SPLICES OR JOINTS AT BUSBARS WITHIN LISTED EQUIPMENT PER [NEC 250.64(C)].
3. GROUNDING ELECTRODE CONDUCTORS SHALL BE NO LESS THAN 8 AWG AND NO GREATER THAN 6 AWG COPPER AND BONDED TO THE EXISTING GROUNDING ELECTRODE TO PROVIDE FOR A COMPLETE SYSTEM.
4. PV SYSTEM SHALL BE GROUNDED IN ACCORDANCE TO [NEC 250.21], [NEC TABLE 250.122], AND ALL METAL PARTS OR MODULE FRAMES ACCORDING TO [NEC 690.46].
5. MODULE SOURCE CIRCUITS SHALL BE GROUNDED IN ACCORDANCE TO [NEC 690.42].
6. THE GROUNDING CONNECTION TO A MODULE SHALL BE ARRANGED SUCH THAT THE REMOVAL OF A MODULE DOES NOT INTERRUPT A GROUNDED CONDUCTOR TO ANOTHER MODULE.
7. EACH MODULE WILL BE GROUNDED USING THE SUPPLIED CONNECTION POINTS IDENTIFIED IN THE MANUFACTURER'S INSTALLATION INSTRUCTIONS.
8. ENCLOSURES SHALL BE PROPERLY PREPARED WITH REMOVAL OF PAINT/FINISH AS APPROPRIATE WHEN GROUNDING EQUIPMENT WITH TERMINATION GROUNDING LUGS.
9. GROUNDING SYSTEM COMPONENTS SHALL BE LISTED FOR THEIR PURPOSE, AND GROUNDING DEVICES EXPOSED TO THE ELEMENTS SHALL BE RATED FOR DIRECT BURIAL.
10. GROUNDING AND BONDING CONDUCTORS SHALL BE COPPER, SOLID OR STRANDED, AND BARE WHEN EXPOSED.
11. EQUIPMENT GROUNDING CONDUCTORS SHALL BE SIZED ACCORDING TO [NEC 690.45] AND BE A MINIMUM OF 10 AWG WHEN NOT EXPOSED TO DAMAGE (6 AWG SHALL BE USED WHEN EXPOSED TO DAMAGE).
12. GROUNDING AND BONDING CONDUCTORS, IF INSULATED, SHALL BE COLOR CODED GREEN (OR MARKED GREEN IF 4 AWG OR LARGER).
13. ALL CONDUIT BETWEEN THE UTILITY AC DISCONNECT AND THE POINT OF CONNECTION SHALL HAVE GROUNDED BUSHINGS AT BOTH ENDS.
14. SYSTEM GEC SIZED ACCORDING TO [NEC 690.47], [NEC TABLE 250.66], DC SYSTEM GEC SIZED ACCORDING TO [NEC 250.166], MINIMUM 8 AWG WHEN INSULATED, 6 AWG WHEN EXPOSED TO DAMAGE.
15. EXPOSED NON-CURRENT CARRYING METAL PARTS OF MODULE FRAMES, EQUIPMENTS, AND CONDUCTOR ENCLOSURES SHALL BE GROUNDED IN ACCORDANCE WITH [NEC 250.134] OR [NEC 250.136(A)] REGARDLESS OF VOLTAGE.

WIRING & CONDUIT NOTES

1. ALL CONDUIT SIZES AND TYPES, SHALL BE LISTED FOR ITS PURPOSE AND APPROVED FOR THE SITE APPLICATIONS.
2. BOLTED CONNECTION REQUIRED IN DC DISCONNECTS ON THE WHITE GROUNDED CONDUCTOR (USE POLARIS BLOCK OR NEUTRAL BAR).
3. ANY CONNECTION ABOVE LIVE PARTS MUST BE WATERTIGHT. REDUCING WASHERS DISALLOWED ABOVE LIVE PARTS, MEYERS HUBS RECOMMENDED
4. UV RESISTANT CABLE TIES (NOT ZIP TIES) USED FOR PERMANENT WIRE MANAGEMENT OFF THE ROOF SURFACE IN ACCORDANCE WITH [NEC 110.2, 110.3(A-B)].
5. SOLADECK JUNCTION BOXES MOUNTED FLUSH WITH ROOF SURFACE TO BE USED FOR WIRE MANAGEMENT AND AS FLASHED ROOF PENETRATIONS FOR INTERIOR CONDUIT RUNS.
6. ALL PV CABLES AND HOMERUN WIRES BE TYPE USE-2, AND SINGLE-CONDUCTOR CABLE LISTED AND IDENTIFIED AS PV WIRE, TYPE TC-ER, OR EQUIVALENT; ROUTED TO SOURCE CIRCUIT COMBINER BOXES AS REQUIRED.
7. ALL CONDUCTORS AND OCPD SIZES AND TYPES SPECIFIED ACCORDING TO [NEC 690.8] FOR MULTIPLE CONDUCTORS.
8. ALL PV DC CONDUCTORS IN CONDUIT EXPOSED TO SUNLIGHT SHALL BE INSTALLED AT LEAST 7/8" ABOVE THE ROOF SURFACE AND DERATED ACCORDING TO [NEC TABLE 310.15 (B)(2)(A)], [NEC TABLE 310.15(B)(3)(A)], & [NEC 310.15(B)(3)(C)].
9. EXPOSED ROOF PV DC CONDUCTORS SHALL BE USE-2, 90°C RATED, WET AND UV RESISTANT, AND UL LISTED RATED FOR 600V, UV RATED SPIRAL WRAP SHALL BE USED TO PROTECT WIRE FROM SHARP EDGES.
10. PHASE AND NEUTRAL CONDUCTORS SHALL BE DUAL RATED THHN/THWN-2 INSULATED, 90°C RATED, WET AND UV RESISTANT, RATED FOR 600V
11. 4-WIRE DELTA CONNECTED SYSTEMS HAVE THE PHASE WITH THE HIGHER VOLTAGE TO GROUND MARKED ORANGE OR IDENTIFIED BY OTHER EFFECTIVE MEANS.
12. ALL SOURCE CIRCUITS SHALL HAVE INDIVIDUAL SOURCE CIRCUIT PROTECTION
13. VOLTAGE DROP LIMITED TO 2% FOR DC CIRCUITS AND 3% FOR AC CIRCUITS
14. NEGATIVE GROUNDED SYSTEMS DC CONDUCTORS SHALL BE COLOR CODED AS FOLLOWS: DC POSITIVE- RED (OR MARKED RED), DC NEGATIVE- GREY (OR MARKED GREY)
15. POSITIVE GROUNDED SYSTEMS DC CONDUCTORS COLOR CODED: DC POSITIVE- GREY (OR MARKED GREY), DC NEGATIVE- BLACK (OR MARKED BLACK)
16. AC CONDUCTORS >4AWG COLOR CODED OR MARKED: PHASE A OR L1- BLACK, PHASE B OR L2- RED, PHASE C OR L3- BLUE, NEUTRAL- WHITE/GRAY
* USE-2 IS NOT INDOOR RATED BUT PV CABLE IS RATED THWN/THWN-2 AND MAY BE USED INSIDE
** USE-2 IS AVAILABLE AS UV WHITE
17. RIGID CONDUIT, IF INSTALLED, (AND/OR NIPPLES) MUST HAVE A PULL BUSHING TO PROTECT WIRES.
18. IF CONDUIT DETERMINED TO BE RAN THROUGH ATTIC IN FIELD THEN CONDUIT WILL BE EITHER EMT, FMC, OR MC CABLE IF DC CURRENT COMPLYING WITH [NEC 690.31], [NEC 250.118(10)]. DISCONNECTING MEANS SHALL COMPLY WITH [NEC 690.13] AND [NEC 690.15].
19. CONDUIT RAN THROUGH ATTIC WILL BE AT LEAST 18" BELOW ROOF SURFACE COMPLYING WITH [NEC 230.6(4)] AND SECURED NO GREATER THAN 6' APART PER [NEC 330.30(B)].

CUSTOMER INFORMATION:
Daniel Morgan
226 Josey Williams road
arwin North Carolina 28339
AC SYSTEM SIZE: 5.51 kW AC
DC SYSTEM SIZE: 7.695 kW DC

DRAWING BY:
Cordell Lawson

PLOT DATE:
July 31, 2023

PROJECT NUMBER:
748461

SHEET NAME:
ELEC CALCS

REVISION: A PAGE NUMBER: PV6

STANDARD LABELS

WARNING
ELECTRIC SHOCK HAZARD
TERMINALS ON THE LINE AND LOAD SIDES MAY BE ENERGIZED IN THE OPEN POSITION

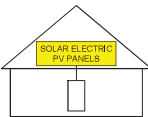
PHOTOVOLTAIC SYSTEM AC DISCONNECT
RATED AC OUTPUT CURRENT 22.99 A
NOMINAL OPERATING AC VOLTAGE 240 V

WARNING
DUAL POWER SUPPLY
SOURCES: UTILITY GRID AND PV SOLAR ELECTRIC SYSTEM

WARNING
POWER SOURCE OUTPUT CONNECTION
DO NOT RELOCATE THIS OVERCURRENT DEVICE

WARNING
THIS EQUIPMENT FED BY MULTIPLE SOURCES. TOTAL RATING OF ALL OVERCURRENT DEVICES, EXCLUDING MAIN SUPPLY OVERCURRENT DEVICE, SHALL NOT EXCEED AMPACITY OF BUSBAR.

SOLAR PV SYSTEM EQUIPPED WITH RAPID SHUTDOWN
TURN RAPID SHUTDOWN SWITCH TO THE "OFF" POSITION TO SHUT DOWN PV SYSTEM AND REDUCE SHOCK HAZARD IN THE ARRAY



RAPID SHUTDOWN SWITCH FOR SOLAR PV SYSTEM

LABEL 1
FOR PV SYSTEM DISCONNECTING MEANS WHERE THE LINE AND LOAD TERMINALS MAY BE ENERGIZED IN THE OPEN POSITION.
[2017 NEC 690.13(B)]
[2020 NEC 690.13(B)]

LABEL 2
SHALL BE MARKED AT AN ACCESSIBLE LOCATION AT THE DISCONNECTING MEANS AS A POWER SOURCE AND WITH THE RATED AC OUTPUT CURRENT AND THE NOMINAL OPERATING AC VOLTAGE.
[2017 NEC 690.54]
[2020 NEC 690.54]

LABEL 3
IF INTERCONNECTING LOAD SIDE, INSTALL THIS LABEL ANYWHERE THAT IS POWERED BY BOTH THE UTILITY AND THE SOLAR PV SYSTEM, IE. MAIN SERVICE PANEL AND SUBPANELS.
[2017 NEC 705.12(B)(3)]
[2020 NEC 705.12(B)(3)]

LABEL 4
APPLY TO THE DISTRIBUTION EQUIPMENT ADJACENT TO THE BACK-FED BREAKER FROM THE POWER SOURCE.
[2017 NEC 705.12(B)(2)(3)(b)]
[2020 NEC 705.12(B)(3)(2)]

LABEL 5
APPLY TO THE PV COMBINER BOX
[2017 NEC 705.12(B)(2)(3)(c)]
[2020 NEC 705.12(B)(3)(3)]

LABEL 6
BUILDINGS WITH PV SYSTEMS SHALL HAVE A PERMANENT LABEL LOCATED AT EACH SERVICE EQUIPMENT LOCATION TO WHICH THE PV SYSTEMS ARE CONNECTED OR AT AN APPROVED READILY VISIBLE LOCATION AND SHALL INDICATE THE LOCATION OF RAPID SHUTDOWN INITIATION DEVICES.
[2017 NEC 690.56(C)(1)(a)]
[2020 NEC 690.56(C)]

LABEL 7
SIGN LOCATED AT RAPID SHUT DOWN DISCONNECT SWITCH
[2017 NEC 690.56(C)(3)]
[2020 NEC 690.56(C)(2)]

WARNING
MAIN DISTRIBUTION UTILITY DISCONNECT(S)
POWER TO THIS BUILDING IS ALSO SUPPLIED FROM A ROOF MOUNTED SOLAR ARRAY WITH A RAPID SHUTDOWN DISCONNECTING MEANS GROUPED AND LABELED WITHIN LINE OF SITE AND 10 FT OF THIS LOCATION

WARNING
POWER TO THIS BUILDING IS ALSO SUPPLIED FROM MAIN DISTRIBUTION UTILITY DISCONNECT LOCATED

WARNING
POWER TO THIS BUILDING IS ALSO SUPPLIED FROM A ROOF MOUNTED SOLAR ARRAY. SOLAR ARRAY RAPID SHUTDOWN DISCONNECT IS LOCATED OUTSIDE NEXT TO THE UTILITY METER.

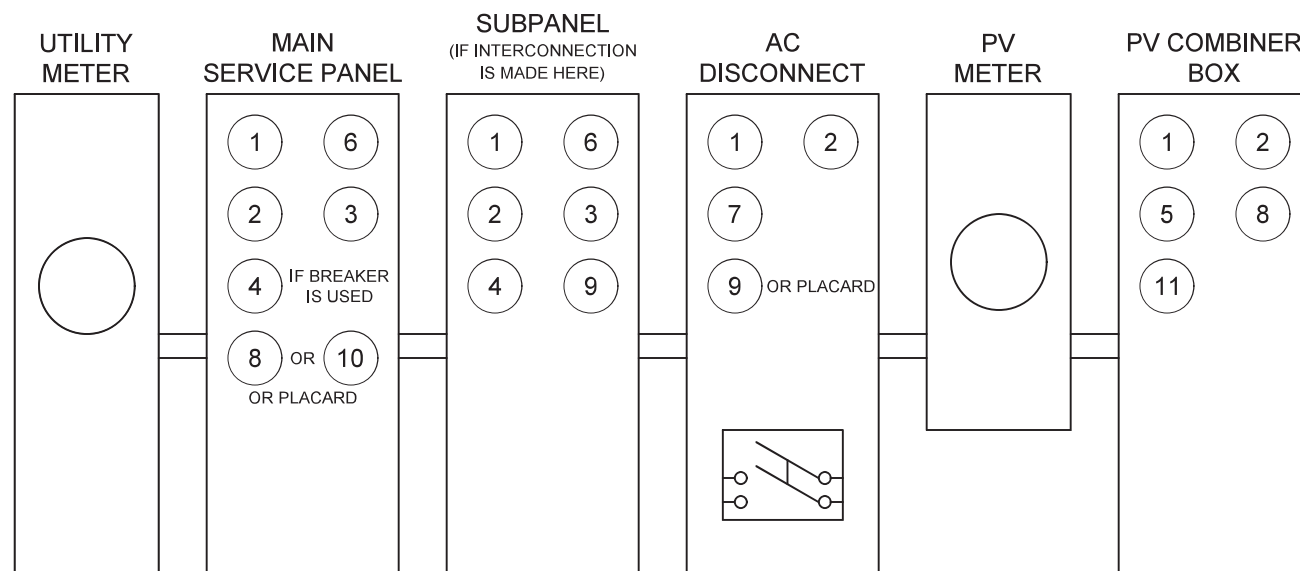
WARNING
PHOTOVOLTAIC SYSTEM COMBINER PANEL
DO NOT ADD LOADS

LABEL 8
PERMANENT PLAQUE OR DIRECTORY DENOTING THE LOCATION OF ALL ELECTRIC POWER SOURCE DISCONNECTING MEANS ON OR IN THE PREMISES SHALL BE INSTALLED AT EACH SERVICE EQUIPMENT LOCATION AND AT THE LOCATION(S) OF THE SYSTEM DISCONNECT(S) FOR ALL ELECTRIC POWER PRODUCTION SOURCES CAPABLE OF BEING INTERCONNECTED.
[2017 NEC 705.10]
[2020 NEC 705.10]

LABEL 9
PERMANENT PLAQUE OR DIRECTORY DENOTING THE LOCATION OF ALL ELECTRIC POWER SOURCE DISCONNECTING MEANS ON OR IN THE PREMISES SHALL BE INSTALLED AT EACH SERVICE EQUIPMENT LOCATION AND AT THE LOCATION(S) OF THE SYSTEM DISCONNECT(S) FOR ALL ELECTRIC POWER PRODUCTION SOURCES CAPABLE OF BEING INTERCONNECTED.
[2017 NEC 705.10]
[2020 NEC 705.10]

LABEL 10
PERMANENT PLAQUE OR DIRECTORY TO BE LOCATED AT MAIN SERVICE EQUIPMENT DENOTING THE LOCATION OF THE RAPID SHUTDOWN SYSTEM DISCONNECTING MEANS IF SOLAR ARRAY RAPID SHUTDOWN DISCONNECTING SWITCH IS NOT GROUPED AND WITHIN LINE OF SITE OF MAIN SERVICE DISCONNECTING MEANS.
[2017 NEC 705.10 AND 690.56(C)(1)(a)]
[2020 NEC 705.10 AND 690.56(C)]

LABEL 11
PERMANENT PLAQUE OR DIRECTORY TO BE LOCATED AT AC COMBINER PANEL.
[2017 NEC 110.21(B)]
[2020 NEC 110.21(B)]



ADDITIONAL LABELS



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NABCEP CERTIFIED
PV INSTALLATION PROFESSIONAL
Scott Gurney
#PV-011719-015866

CONTRACTOR:
BRS FIELD OPS
800-377-4480

CUSTOMER INFORMATION:
Daniel Morgan
226 josey williams road
arwin North Carolina 28339
AC SYSTEM SIZE: 5.51 kW AC
DC SYSTEM SIZE: 7.695 kW DC

DRAWING BY:
Cordell Lawson

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748461

SHEET NAME:
LABELS

REVISION: **A** PAGE NUMBER: **PV7**

LABELING NOTES
1) LABELS CALLED OUT ACCORDING TO ALL COMMON CONFIGURATIONS. ELECTRICIAN TO DETERMINE EXACT REQUIREMENTS IN THE FIELD PER CURRENT NEC AND LOCAL CODES AND MAKE APPROPRIATE ADJUSTMENTS.
2) LABELING REQUIREMENTS BASED ON THE 2017 & 2020 NEC CODE, OSHA STANDARD 19010.145, ANSIZ535.
3) MATERIAL BASED ON THE REQUIREMENTS OF THE AHJ.
4) LABELS TO BE OF SUFFICIENT DURABILITY TO WITHSTAND THE ENVIRONMENT INVOLVED AND SHALL NOT BE HANDWRITTEN [NEC 110.21]

*ELECTRICAL DIAGRAM SHOWN ABOVE IS FOR LABELING PURPOSES ONLY. NOT AN ACTUAL REPRESENTATION OF EQUIPMENT AND CONNECTIONS TO BE INSTALLED. LABEL LOCATIONS PRESENTED MAY VARY DEPENDING ON TYPE OF INTERCONNECTION METHOD AND LOCATION PRESENTED ON 3 LINE DIAGRAM. 3 LINE DIAGRAM ON PV5 TO REFLECT ACTUAL REPRESENTATION OF PROPOSED SCOPE OF WORK.



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PV INSTALLATION PROFESSIONAL Scott Gurney #PV-011719-015866

CONTRACTOR: BRS FIELD OPS 385-498-6700



SIV SERIES

Small Changes, Big Accomplishments

405-420W

• SIV SERIES

SEG Solar INC. (SEG) redefined the high-efficiency module series by integrating 182mm silicon wafers with multi-busbar and half-cut cell technologies. SEG panel combined creative technology effectively and extremely improved the module efficiency and power output.

• KEY FEATURES

- The transmittance of 400-1100nm band in the transparent region is ≥90%
- Using POE or EVA package, there is no need to worry about component power attenuation caused by PID
- A transparent backsheet reduces module weight by 30%, resulting in reduced shipping and installation costs
- Through ultraviolet 500kWh/m2 strict test, fully meet the requirements of 25 years of use of the modules
- Timely release of packaging material decomposition of acetic acid, effectively reduce the concentration of acetic acid modules
- PVEL Consistent with conventional component production process, no need to modify production equipment

• PRODUCT CERTIFICATION

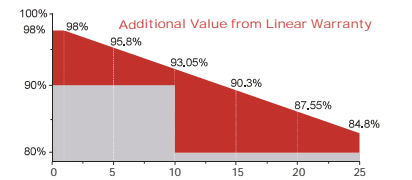
IEC61215:2016	IEC 61730:2016	UL1703	UL61730/CSA/CEC
IEC62804		PID	
IEC61701		Salt Mist	
IEC62716		Ammonia Resistance	
IEC60068		Dust and Sand	
IEC61215		Hailstone(25mm)	
Fire Type (UL61730):1/29	(Type1-HV Type29-BG)		
ISO14001:2015	ISO9001:2015	ISO45001:2018	



• INSURANCE



• WARRANTY



15 YEARS Guarantee on product material and workmanship

25 YEARS Linear power output warranty

Mechanical Specifications

External Dimension	1722 x 1134 x 30 mm
Weight	21.5 kg
Solar Cells	PERC Mono crystalline(108 pcs)
Front Glass	3.2 / mm AR coating semi-tempered glass / low iron
Backsheet	Transparent backsheet
Frame	Black anodized aluminium alloy
Junction Box	IP68 / 3 diodes
Connector Type	MC4
Cable Type / Length	12 AWG PV Wire (UL/IEC) / 1200 mm
Mechanical Load(Front)	5400 Pa / 113 psf*
Mechanical Load(Rear)	3600 Pa / 75 psf*

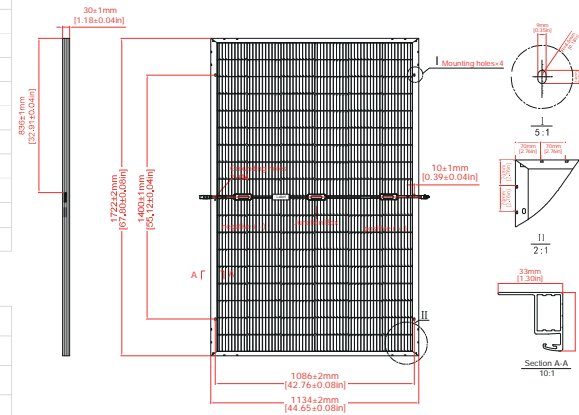
*Refer to SEG installation Manual for details

Packing Configuration

Container	20'GP	40'HQ
Pieces per Pallet	40	36
Pallets per Container	6	26
Pieces per Container	240	936

For details, please consult SEG.

Technical Drawing



Electrical Characteristics

Module Type	SEG-405-BMD-TB			SEG-410-BMD-TB			SEG-415-BMD-TB			SEG-420-BMD-TB		
	Front STC	Front NOCT	Back STC	Front STC	Front NOCT	Back STC	Front STC	Front NOCT	Back STC	Front STC	Front NOCT	Back STC
Maximum Power -P _{mp} (W)	405	304	284	410	308	287	415	311	291	420	314	294
Open Circuit Voltage -V _{oc} (V)	37.22	34.73	37.20	37.32	34.81	37.30	37.42	34.90	37.40	37.52	34.99	37.50
Short Circuit Current -I _{sc} (A)	13.70	11.07	9.66	13.80	11.15	9.73	13.90	11.23	9.80	14.00	11.31	9.87
Maximum Power Voltage -V _{mp} (V)	30.93	28.91	30.98	31.05	29.05	31.03	31.16	29.19	31.17	31.28	29.33	31.29
Maximum Power Current -I _{mp} (A)	13.10	10.51	9.17	13.21	10.59	9.25	13.32	10.66	9.34	13.43	10.73	9.42
Module Efficiency STC-η _m (%)	20.74			21.00			21.25			21.51		
Power Tolerance (W)	(0, +4.99)											
Pmax Temperature Coefficient	-0.34 %/°C											
Voc Temperature Coefficient	-0.26 %/°C											
Isc Temperature Coefficient	+0.05 %/°C											

STC: Irradiance 1000 W/m² module temperature 25°C AM=1.5
 NOCT: Irradiance 800W/m² ambient temperature 20°C module temperature 45°C wind speed: 1m/s
 Power measurement tolerance: +/-3%

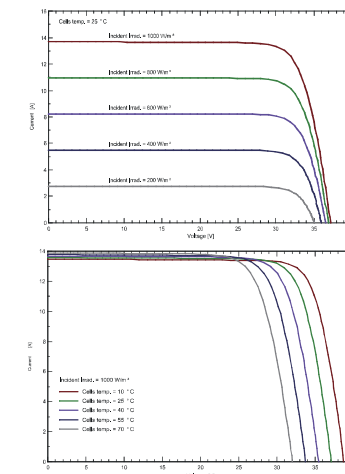
Rear Side Power Gain(SEG-410-BMD-TB)

Power Gain	10%	15%	20%	25%	30%
Maximum Power -P _{mp} (W)	451	472	492	513	533
Open Circuit Voltage -V _{oc} (V)	37.22	37.22	37.22	37.22	37.22
Short Circuit Current -I _{sc} (A)	15.18	15.87	16.56	17.25	17.94
Maximum Power Voltage -V _{mp} (V)	31.05	31.05	31.05	31.05	31.05
Maximum Power Current -I _{mp} (A)	14.53	15.19	15.85	16.51	17.17

Application Conditions

Maximum System Voltage	1500V DC
Maximum Series Fuse Rating	25 A
Operating Temperature	-40~+85 °C
Nominal Operating Cell Temperature	45±2 °C
Bifaciality	70%±10%

I-V Curve



Specifications are subject to change without further notification SEG-DS-EN-2022V1.0 © Copyright 2022 SEG

SEG SOLAR INC. (SEG)

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 SEG San Antonio, Texas office: 973 Isom Road San Antonio, TX 78216
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IQ8 and IQ8+ Microinverters

Our newest IQ8 Microinverters are the industry's first microgrid-forming, software-defined microinverters with split-phase power conversion capability to convert DC power to AC power efficiently. The brain of the semiconductor-based microinverter is our proprietary application-specific integrated circuit (ASIC) which enables the microinverter to operate in grid-tied or off-grid modes. This chip is built in advanced 55nm technology with high speed digital logic and has super-fast response times to changing loads and grid events, alleviating constraints on battery sizing for home energy systems.



Part of the Enphase Energy System, IQ8 Series Microinverters integrate with the Enphase IQ Battery, Enphase IQ Gateway, and the Enphase App monitoring and analysis software.



IQ8 Series Microinverters redefine reliability standards with more than one million cumulative hours of power-on testing, enabling an industry-leading limited warranty of up to 25 years.



Connect PV modules quickly and easily to IQ8 Series Microinverters using the included Q-DCC-2 adapter cable with plug-n-play MC4 connectors.



IQ8 Series Microinverters are UL Listed as PV Rapid Shut Down Equipment and conform with various regulations, when installed according to manufacturer's instructions.

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IQ8SP-DS-0002-01-EN-US-2022-03-17

Easy to install

- Lightweight and compact with plug-n-play connectors
- Power Line Communication (PLC) between components
- Faster installation with simple two-wire cabling

High productivity and reliability

- Produce power even when the grid is down*
- More than one million cumulative hours of testing
- Class II double-insulated enclosure
- Optimized for the latest high-powered PV modules

Microgrid-forming

- Complies with the latest advanced grid support**
- Remote automatic updates for the latest grid requirements
- Configurable to support a wide range of grid profiles
- Meets CA Rule 21 (UL 1741-SA) requirements

* Only when installed with IQ System Controller 2, meets UL 1741.

** IQ8 and IQ8Plus supports split phase, 240V installations only.

IQ8 and IQ8+ Microinverters

INPUT DATA (DC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Commonly used module pairings ¹	W	235 – 350	235 – 440
Module compatibility		60-cell/120 half-cell	60-cell/120 half-cell, 66-cell/132 half-cell and 72-cell/144 half-cell
MPPT voltage range	V	27 – 37	29 – 45
Operating range	V	25 – 48	25 – 58
Min/max start voltage	V	30 / 48	30 / 58
Max input DC voltage	V	50	60
Max DC current ² [module Isc]	A		15
Overvoltage class DC port			II
DC port backfeed current	mA		0
PV array configuration		1x1 Ungrounded array; No additional DC side protection required; AC side protection requires max 20A per branch circuit	
OUTPUT DATA (AC)		IQ8-60-2-US	IQ8PLUS-72-2-US
Peak output power	VA	245	300
Max continuous output power	VA	240	290
Nominal (L-L) voltage/range ³	V	240 / 211 – 264	
Max continuous output current	A	1.0	1.21
Nominal frequency	Hz	60	
Extended frequency range	Hz	50 – 68	
AC short circuit fault current over 3 cycles	Arms	2	
Max units per 20 A (L-L) branch circuit ⁴		16	13
Total harmonic distortion		<5%	
Overvoltage class AC port		III	
AC port backfeed current	mA	30	
Power factor setting		1.0	
Grid-tied power factor (adjustable)		0.85 leading – 0.85 lagging	
Peak efficiency	%	97.5	97.6
CEC weighted efficiency	%	97	97
Night-time power consumption	mW	60	
MECHANICAL DATA			
Ambient temperature range		-40°C to +60°C (-40°F to +140°F)	
Relative humidity range		4% to 100% (condensing)	
DC Connector type		MC4	
Dimensions (HxWxD)		212 mm (8.3") x 175 mm (6.9") x 30.2 mm (1.2")	
Weight		1.08 kg (2.38 lbs)	
Cooling		Natural convection – no fans	
Approved for wet locations		Yes	
Pollution degree		PD3	
Enclosure		Class II double-insulated, corrosion resistant polymeric enclosure	
Environ. category / UV exposure rating		NEMA Type 6 / outdoor	
COMPLIANCE			
Certifications		CA Rule 21 (UL 1741-SA), UL 62109-1, UL1741/IEEE1547, FCC Part 15 Class B, ICES-0003 Class B, CAN/CSA-C22.2 NO. 107.1-01	
		This product is UL Listed as PV Rapid Shut Down Equipment and conforms with NEC 2014, NEC 2017, and NEC 2020 section 690.12 and C22.1-2018 Rule 64-218 Rapid Shutdown of PV Systems, for AC and DC conductors, when installed according to manufacturer's instructions.	

(1) No enforced DC/AC ratio. See the compatibility calculator at <https://link.enphase.com/module-compatibility>
 (2) Maximum continuous input DC current is 10.6A (3) Nominal voltage range can be extended beyond nominal if required by the utility. (4) Limits may vary. Refer to local requirements to define the number of microinverters per branch in your area.

IQ8SP-DS-0002-01-EN-US-2022-03-17

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PV INSTALLATION PROFESSIONAL
Scott Gurney
#PV-011719-015866

CONTRACTOR:
BRS FIELD OPS
385-498-6700

DRAWING BY:

PLOT DATE:

PROJECT NUMBER:

SHEET NAME:

SPEC SHEET

REVISION:

PAGE NUMBER:

SS

IQ Combiner 4/4C



The **IQ Combiner 4/4C** with IQ Gateway and integrated LTE-M1 cell modem (included only with IQ Combiner 4C) consolidates interconnection equipment into a single enclosure. It streamlines IQ Microinverters and storage installations by providing a consistent, pre-wired solution for residential applications. It offers up to four 2-pole input circuits and Eaton BR series busbar assembly.

Smart

- Includes IQ Gateway for communication and control
- Includes Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), included only with IQ Combiner 4C
- Includes solar shield to match Enphase IQ Battery aesthetics and deflect heat
- Supports Wi-Fi, Ethernet, or cellular connectivity
- Optional AC receptacle available for PLC bridge
- Provides production metering and consumption monitoring

Simple

- Mounts on single stud with centered brackets
- Supports bottom, back and side conduit entry
- Allows up to four 2-pole branch circuits for 240VAC plug-in breakers (not included)
- 80A total PV or storage branch circuits

Reliable

- Durable NRTL-certified NEMA type 3R enclosure
- Five-year limited warranty
- Two years labor reimbursement program coverage included for both the IQ Combiner SKU's
- UL listed
- X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C comply with IEEE 1547:2018 (UL 1741-SB, 3rd Ed.)



To learn more about Enphase offerings, visit enphase.com
IQ-C-4-4C-DS-0103-EN-US-12-29-2022



IQ Combiner 4/4C

MODEL NUMBER

IQ Combiner 4 X-IQ-AM1-240-4 X2-IQ-AM1-240-4 (IEEE 1547:2018)	IQ Combiner 4 with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ± 0.5%) and consumption monitoring (± 2.5%). Includes a silver solar shield to match the IQ Battery and IQ System Controller 2 and to deflect heat.
IQ Combiner 4C X-IQ-AM1-240-4C X2-IQ-AM1-240-4C (IEEE 1547:2018)	IQ Combiner 4C with IQ Gateway printed circuit board for integrated revenue grade PV production metering (ANSI C12.20 ± 0.5%) and consumption monitoring (± 2.5%). Includes Mobile Connect cellular modem (CELLMODEM-M1-06-SP-05), a plug-and-play industrial-grade cell modem for systems up to 60 microinverters. (Available in the US, Canada, Mexico, Puerto Rico, and the US Virgin Islands, where there is adequate cellular service in the installation area.) Includes a silver solar shield to match the IQ Battery and IQ System Controller - and to deflect heat.

ACCESSORIES AND REPLACEMENT PARTS (not included, order separately)

Supported microinverters	IQ6, IQ7, and IQ8. (Do not mix IQ6/7 Microinverters with IQ8)
Communications Kit COMMS-CELLMODEM-M1-06 CELLMODEM-M1-06-SP-05 CELLMODEM-M1-06-AT-05	- Includes COMMS-KIT-01 and CELLMODEM-M1-06-SP-05 with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year Sprint data plan - 4G based LTE-M1 cellular modem with 5-year AT&T data plan
Circuit Breakers BRK-10A-2-240V BRK-15A-2-240V BRK-20A-2P-240V BRK-15A-2P-240V-B BRK-20A-2P-240V-B	Supports Eaton BR210, BR215, BR220, BR230, BR240, BR250, and BR260 circuit breakers. Circuit breaker, 2 pole, 10A, Eaton BR210 Circuit breaker, 2 pole, 15A, Eaton BR215 Circuit breaker, 2 pole, 20A, Eaton BR220 Circuit breaker, 2 pole, 15A, Eaton BR215B with hold down kit support Circuit breaker, 2 pole, 20A, Eaton BR220B with hold down kit support
XA-SOLARSHIELD-ES	Replacement solar shield for IQ Combiner 4/4C
XA-PLUG-120-3	Accessory receptacle for Power Line Carrier in IQ Combiner 4/4C (required for EPLC-01)
X-IQ-NA-HD-125A	Hold-down kit for Eaton circuit breaker with screws
Consumption monitoring CT (CT-200-SPLIT/CT-200-CLAMP)	A pair of 200A split core current transformers

ELECTRICAL SPECIFICATIONS

Rating	Continuous duty
System voltage	120/240VAC, 60 Hz
Eaton BR series busbar rating	125A
Max. continuous current rating	65A
Max. continuous current rating (input from PV/storage)	64A
Max. fuse/circuit rating (output)	90A
Branch circuits (solar and/or storage)	Up to four 2-pole Eaton BR series Distributed Generation (DG) breakers only (not included)
Max. total branch circuit breaker rating (input)	80A of distributed generation/95A with IQ Gateway breaker included
IQ Gateway breaker	10A or 15A rating GE/Siemens/Eaton included
Production metering CT	200A solid core pre-installed and wired to IQ Gateway

MECHANICAL DATA

Dimensions (WxHxD)	37.5 cm x 49.5 cm x 16.8 cm (14.75 in x 19.5 in x 6.63 in). Height is 53.5 cm (21.06 in) with mounting brackets.
Weight	7.5 kg (16.5 lbs)
Ambient temperature range	-40°C to +46°C (-40°F to 115°F)
Cooling	Natural convection, plus heat shield
Enclosure environmental rating	Outdoor, NRTL-certified, NEMA type 3R, polycarbonate construction
Wire sizes	• 20A to 50A breaker inputs: 14 to 4 AWG copper conductors • 60A breaker branch input: 4 to 1/0 AWG copper conductors • Main lug combined output: 10 to 2/0 AWG copper conductors • Neutral and ground: 14 to 1/0 copper conductors • Always follow local code requirements for conductor sizing.
Altitude	Up to 3,000 meters (9,842 feet)

INTERNET CONNECTION OPTIONS

Integrated Wi-Fi	IEEE 802.11b/g/n
Cellular	CELLMODEM-M1-06-SP-05, CELLMODEM-M1-06-AT-05 (4G based LTE-M1 cellular modem). Note that an Mobile Connect cellular modem is required for all Enphase Energy System installations.
Ethernet	Optional, IEEE 802.3, Cat5E (or Cat6) UTP Ethernet cable (not included)

COMPLIANCE

Compliance, IQ Combiner	CA Rule 21 (UL 1741-SA) IEEE 1547:2018 - UL 1741-SB, 3 rd Ed. (X2-IQ-AM1-240-4 and X2-IQ-AM1-240-4C) CAN/CSA C22.2 No. 107.1, Title 47 CFR, Part 15, Class B, ICES 003 Production metering: ANSI C12.20 accuracy class 0.5 (PV production) Consumption metering: accuracy class 2.5
Compliance, IQ Gateway	UL 60601-1/CANCSA 22.2 No. 61010-1

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IQ-C-4-4C-DS-0103-EN-US-12-29-2022



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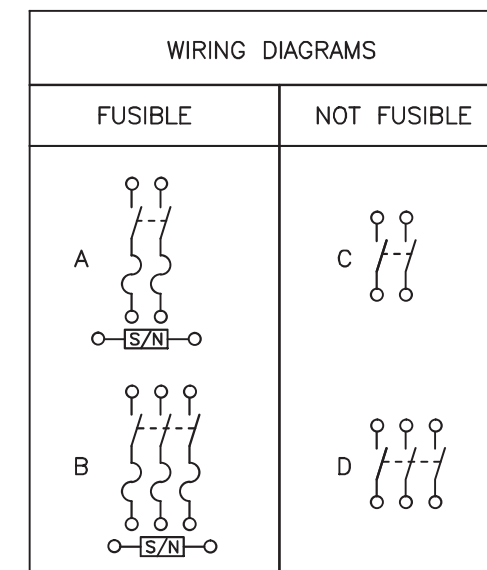
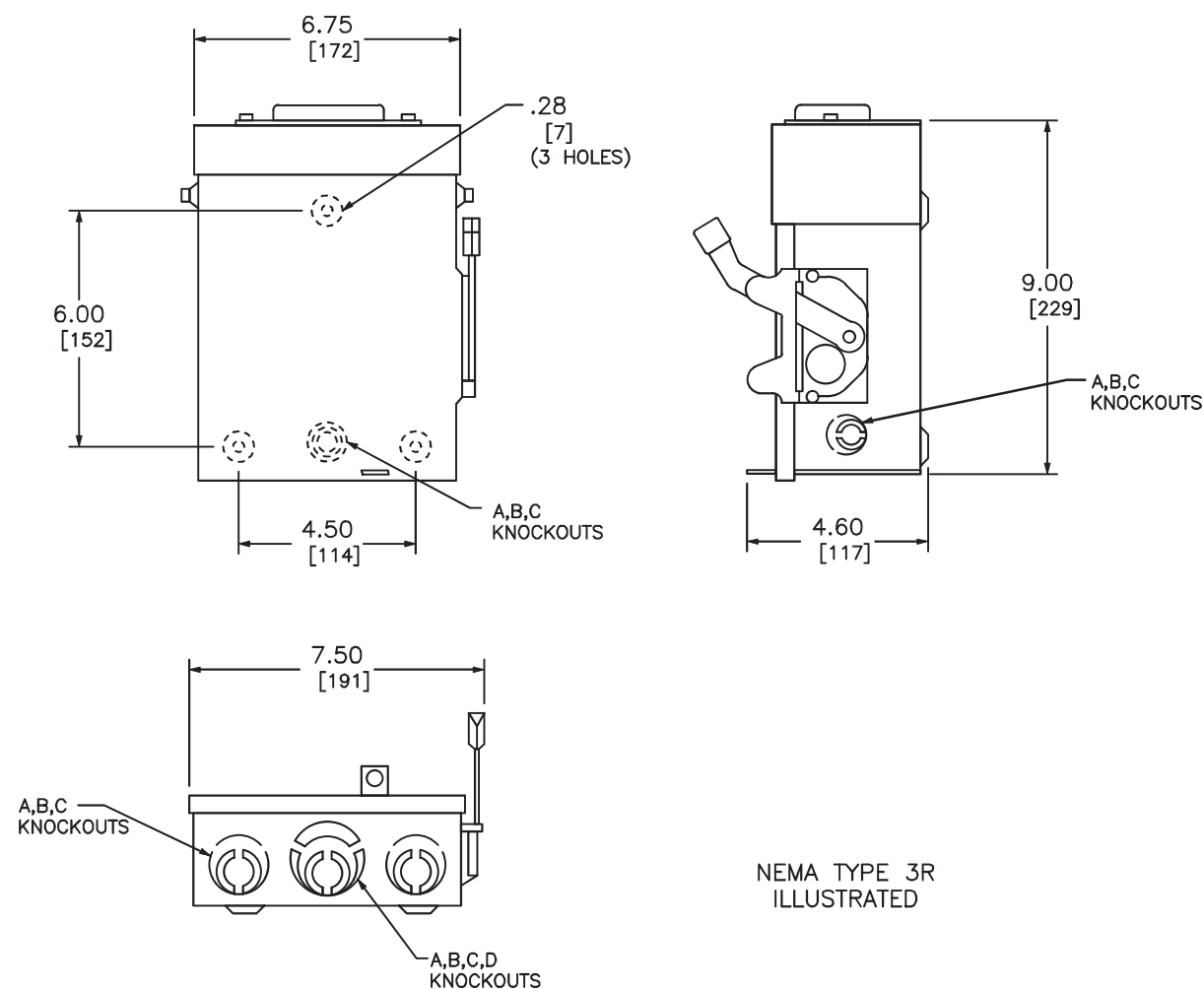
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TERMINAL LUGS ‡			
AMPERES	MAX. WIRE	MIN. WIRE	TYPE
30	# 6 AWG	# 12 AWG	AL
	# 6 AWG	# 14 AWG	CU


KNOCKOUTS				
SYMBOL	A	B	C	D
CONDUIT SIZE	.50	.75	1	1.25

DUAL DIMENSIONS: INCHES
MILLIMETERS

CATALOG NUMBER	VOTAGE RATINGS	WIRING DIAG.	HORSEPOWER RATINGS					
			120VAC		240VAC			
			STD.	MAX.	STD.		MAX.	
			1 Ø	1 Ø	1 Ø	3 Ø	1 Ø	3 Ø
D211NRB ● ■	240VAC	A	1/2	2	1 1/2	-	3	-
D221NRB	240VAC	A	-	-	1 1/2	3*	3	7 1/2*
D321NRB	240VAC	B	-	-	1 1/2	3	3	7 1/2
DU221RB	240VAC	C	-	-	-	-	3	-
DU321RB	240VAC	D	-	-	-	-	3	7 1/2

NOTES:
FINISH - GRAY BAKED ENAMEL ELECTRODEPOSITED OVER CLEANED PHOSPHATIZED STEEL.
UL LISTED - FILE E-2875
ALL NEUTRALS - INSULATED GROUNDABLE
SUITABLE FOR USE AS SERVICE EQUIPMENT
TOP OF NEMA TYPE 3R SWITCHES HAVE PROVISIONS FOR MAXIMUM 2 1/2" BOLT-ON HUB.
SHORT CIRCUIT CURRENT RATINGS:
● 10,000 AMPERES.
■ 10,000 AMPERES WHEN USED WITH OR PROTECTED BY CLASS H OR K FUSES.
■ 100,000 AMPERES WITH CLASS R FUSES.
* FOR CORNER GROUNDING DELTA SYSTEMS.
■ PLUG FUSES
‡ LUGS SUITABLE FOR 60°C OR 75° CONDUCTORS.

GENERAL DUTY SAFETY SWITCHES
VISIBLE BLADE TYPE
30 AMPERE
ENCLOSURE - NEMA TYPE 3R RAINPROOF



by Schneider Electric

DWG# 1852
NO.

DRAWING BY:

PLOT DATE:

PROJECT NUMBER:

SHEET NAME:

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PAGE NUMBER:

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A. System Specifications and Ratings

- Maximum Voltage: 1,000 Volts
- Maximum Current: 80 Amps
- Allowable Wire: 14 AWG – 6 AWG
- Spacing: Please maintain a spacing of at least ½” between uninsulated live parts and fittings for conduit, armored cable, and uninsulated live parts of opposite polarity.
- Enclosure Rating: Type 3R
- Roof Slope Range: 2.5 – 12:12
- Max Side Wall Fitting Size: 1”
- Max Floor Pass-Through Fitting Size: 1”
- Ambient Operating Conditions: (-35°C) - (+75°C)
- Compliance:
 - JB-1.2: UL1741
 - Approved wire connectors: must conform to UL1741
- System Marking: **Interek Symbol and File #5019942**
- Periodic Re-inspections: If re-inspections yield loose components, loose fasteners, or any corrosion between components, components that are found to be affected are to be replaced immediately.

ITEM NO.	PART NUMBER	DESCRIPTION	QTY
1	JB-1.2 BODY	POLYCARBONATE WITH UV INHIBITORS	1
2	JB-1.2 LID	POLYCARBONATE WITH UV INHIBITORS	1
3	#10 X 1-1/4" PHILLIPS PAN HEAD SCREW		6
4	#8 X 3/4" PHILLIPS PAN HEAD SCREW		6

SIZE	DWG. NO.	REV
B	JB-1.2	
SCALE: 1:2	WEIGHT: 1.45 LBS	SHEET 1 OF 3

TORQUE SPECIFICATION:	15-20 LBS
CERTIFICATION:	UL STANDARD 1741, NEMA 3R
WEIGHT:	1.45 LBS



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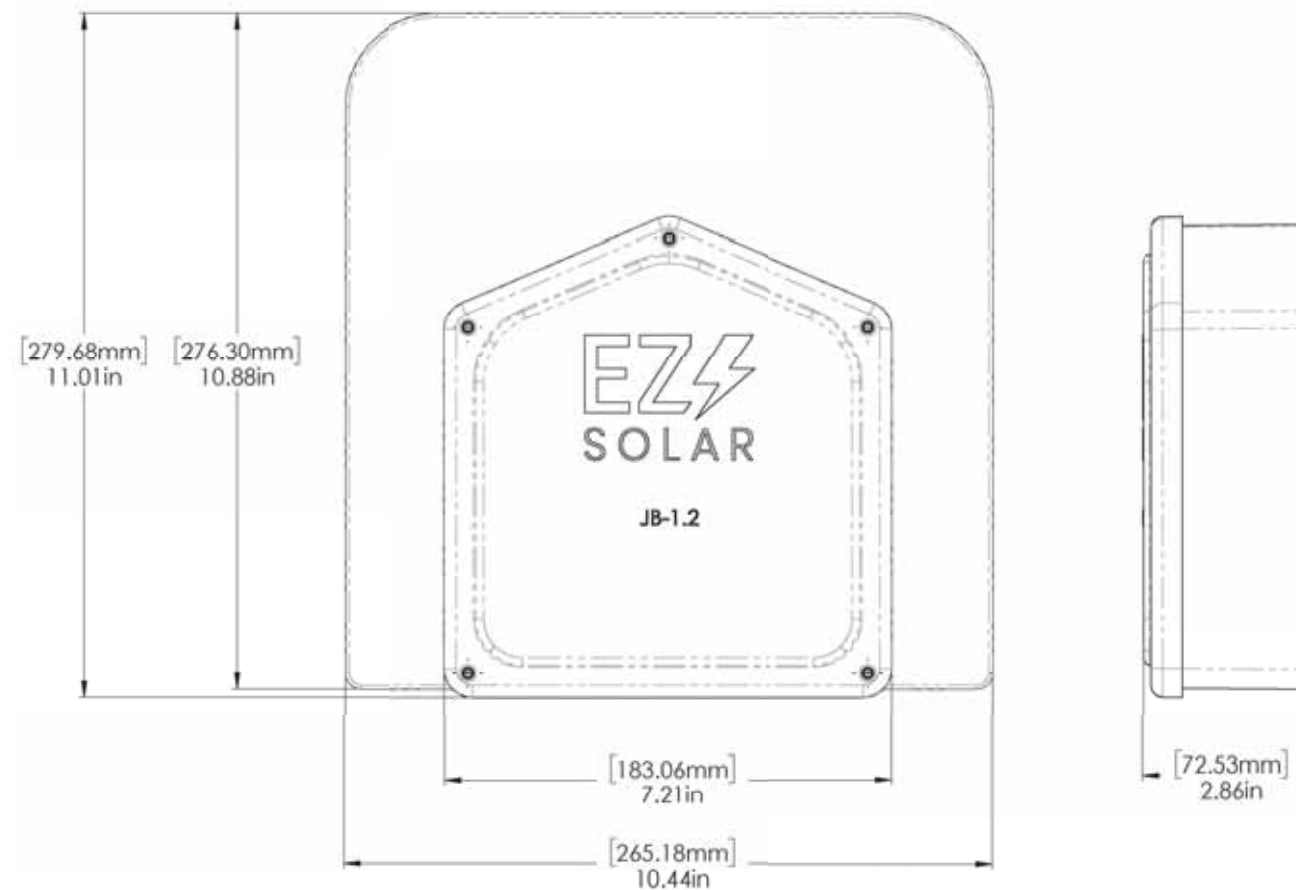
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Table 1: Typical Wire Size, Torque Loads and Ratings

	1 Conductor	2 Conductor	Torque				
			Type	NM	Inch Lbs	Voltage	Current
ABB Z56 terminal block	10-24 awg	16-24 awg	Sol/Str	0.5-0.7	6.2-8.85	600V	30 amp
ABB Z510 terminal block	6-24 awg	12-20 awg	Sol/Str	1.0-1.6	8.85-14.16	600V	40 amp
ABB Z516 terminal block	4-24 awg	10-20 awg	Sol/Str	1.6-2.4	14.6-21.24	600V	60 amp
ABB M6/8 terminal block	8-22 awg		Sol/Str	.08-1	8.85	600V	50 amp
Ideal 452 Red WING-NUT Wire Connector	8-18 awg		Sol/Str	Self Torque	Self Torque	600V	
Ideal 451 Yellow WING-NUT Wire Connector	10-18 awg		Sol/Str	Self Torque	Self Torque	600V	
Ideal, In-Sure Push-In Connector Part #39	10-14 awg		Sol/Str	Self Torque	Self Torque	600V	
WAGO, 2204-1201	10-20 awg	16-24 awg	Sol/Str	Self Torque	Self Torque	600V	30 amp
WAGO, 221-612	10-20 awg	10-24 awg	Sol/Str	Self Torque	Self Torque	600V	30 amp
Dottie DRC75	6-12 awg		Sol/Str	Snap-In	Snap-In		
ESP NG-53	4-6 awg		Sol/Str		45	2000V	
	10-14 awg		Sol/Str		35		
ESP NG-717	4-6 awg		Sol/Str		45	2000V	
	10-14 awg		Sol/Str		35		
Brumall 4-5,3	4-6 awg		Sol/Str		45	2000V	
	10-14 awg		Sol/Str		35		

Table 2: Minimum wire-bending space for conductors through a wall opposite terminals in mm (inches)

Wire size, AWG or	Wires per terminal (pole)			
	1	2	3	4 or More
kcmil (mm2)	mm (inch)	mm (inch)	mm (inch)	mm (inch)
14-10 (2.1-5.3)	Not specified	-	-	-
8 (8.4)	38.1 (1-1/2)	-	-	-
6 (13.3)	50.8 (2)	-	-	-



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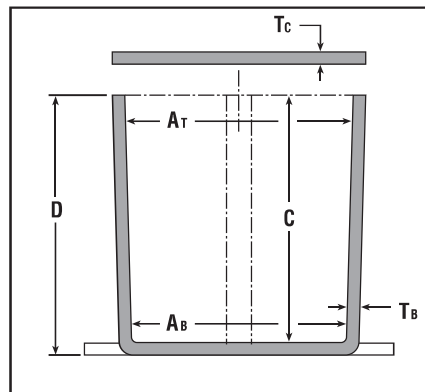
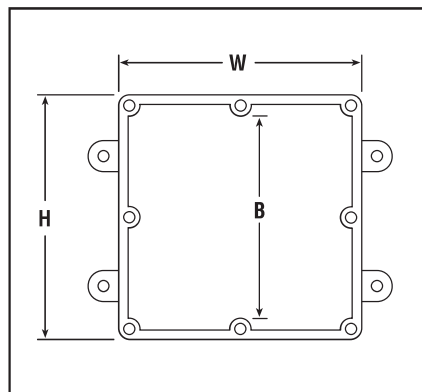
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Rigid Nonmetallic Conduit – Junction Boxes

Molded Nonmetallic Junction Boxes 6P Rated

It's another first from Carlon® - the first nonmetallic junction boxes UL Listed with a NEMA 6P rating per Section 314.29, Exception of the National Electrical Code. Manufactured from PVC or PPO thermoplastic molding compound and featuring foam-in-place gasketed lids attached with stainless steel screws, these rugged enclosures offer all the corrosion resistance and physical properties you need for direct burial applications.

Type 6P enclosures are intended for indoor or outdoor use, primarily to provide a degree of protection against contact with enclosed equipment, falling dirt, hose-directed water, entry of water during prolonged submersion at a limited depth, and external ice formation.



- All Carlon Junction Boxes are UL Listed and maintain a minimum of a NEMA Type 4/4X Rating.
- Parts numbers with an asterisk (*) are UL Listed and maintain a NEMA Type 6P Rating and Type 4/4X Rating.

Part No.	Size in Inches H x W x D	Std. Ctn. Qty.	Min. At	Min. Ab	Min. B	Min. C	Ta	Tc Typical	Material		Std. Ctn. Wt. (Lbs.)
									PVC	Thermo-plastic	
E989NNJ-CAR*	4 x 4 x 2	5	3 11/16	3 5/8	N/A	2	.160	.155	X		3
E987N-CAR*	4 x 4 x 4	5	3 11/16	3 1/2	N/A	4	.160	.155	X		4
†E989NNR-CAR*	4 x 4 x 6	4	3 11/16	3 3/8	N/A	6	.160	.200	X		5
E989PPJ-CAR*	5 x 5 x 2	4	4 11/16	4 1/2	N/A	2	.110	.150		X	3
E987R-CAR*	6 x 6 x 4	2	6	5 5/8	N/A	4	.190	.190		X	3
E989RRR-UPC*	6 x 6 x 6	8	5 5/8	5 3/8	N/A	6	.160	.150		X	14
E989N-CAR	8 x 8 x 4	1	8	8	N/A	4	.185	.190		X	2
E989SX-UPC	8 x 8 x 7	2	7 21/32	7 5/16	N/A	7	.160	.150		X	6
E989UUN	12 x 12 x 4	3	11 5/8	11 1/2	11 1/8	4	.160	.150		X	12
E989R-UPC	12 x 12 x 6	2	11 5/16	11 7/8	11 7/16	6	.265	.185		X	10

VIEW SHOWN LESS COVER FOR CLARITY

SECTION A-A
SCALE 0.500

SIZE	A	B	C
E989NNJ E989NNJ E989NNJ-CAR E989NNJCL E989NNJL (4X4X2)	2.00 (50.8)	4.63 (117.6)	5.13 (130.2)
E989NNR E989NNR-CAR (4X4X6)	8.00 (152.4)	5.00 (127.0)	5.50 (139.7)

NOTES:
1. MATERIAL: PVC
2. NEMA TYPES: 4/4X, 6P

GENERAL NOTES

1. ALL DIMENSIONS ARE FOR REFERENCE ONLY.
2. DIMENSIONS IN BRACKETS [] ARE IN METRIC UNITS.

REVISIONS

F SEE ERN 2016195 FOR APPROVAL SIGNATURES & RELEASE DATE.
PROJECT NO: 5AM000006

Thomas & Betts
www.tnb.com

DESCRIPTION: **MOLDED NON-METALLIC ENCLOSURE**

ORIGINAL PROJECT NO / (ERN NO)	SHEET NO:	REV. NO:	DRAWING NO:
/ ()	2 OF 2	F	WSD-AC01977

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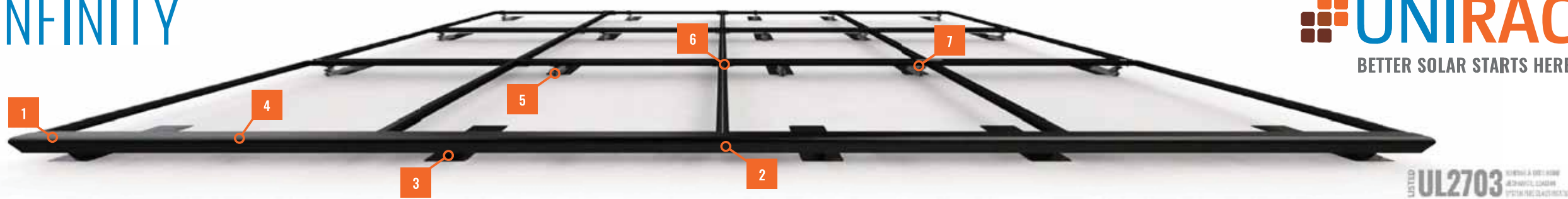
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SFM INFINITY



LISTED **UL2703** WITH A DESIGN APPROVAL, LISTED SYSTEM CLASSIFICATION



2 INSTALLS PER DAY

Make two installs per day your new standard. **SFM INFINITY** has fewer roof attachments, one tool installation, and pre-assembled components to get you off the roof 40% faster.

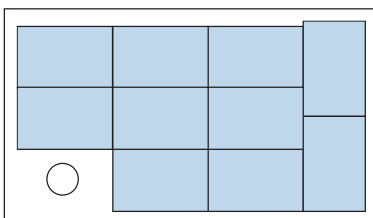
87% OF HOMEOWNERS PREFER

BETTER AESTHETICS








Install the system with the aesthetics preferred by homeowners, with integrated front trim, trim end caps, dark components, and recessed hardware.

MAXIMUM POWER DENSITY




Easily mix module orientations to achieve optimal power density without incurring the increased bill of materials, labor, and attachments required by rail.



SYSTEM OVERVIEW

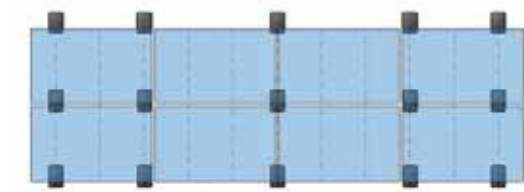
	PART NAME	DESCRIPTION
1	 TRIMRAIL	Structural front trim provides aesthetic and aligns modules.
2	 TRIMRAIL SPLICE	Connects and electrically bonds sections of TRIMRAIL.
3	 TRIMRAIL FLASHKIT	Attaches TRIMRAIL to roof. Available for comp shingle or tile.
4	 MODULE CLIPS	Secure modules to TRIMRAIL.
5	 MICRORAIL	Connects modules to SLIDERS. Provides post-install array leveling.
6	 SPLICE	Connects and supports modules. Provides east-west bonding. ATTACHED SPLICE also available.
7	 SLIDER FLASHKIT	Roof attachment and flashing. Available for comp shingle and tile.

BONDING AND ACCESSORIES

	PART NAME	DESCRIPTION
	 TRIMRAIL ENDCAPS	Covers ends of TRIMRAIL for refined aesthetic.
	 TRIMRAIL BONDING CLAMP	Electrically bonds TRIMRAIL and modules
	 N/S BONDING CLAMP	Electrically bonds rows of modules

20% FEWER ATTACHMENTS

Save time and money on every project: **SFM INFINITY** requires fewer attachments than rail systems.



SFM INFINITY 15 Attachments



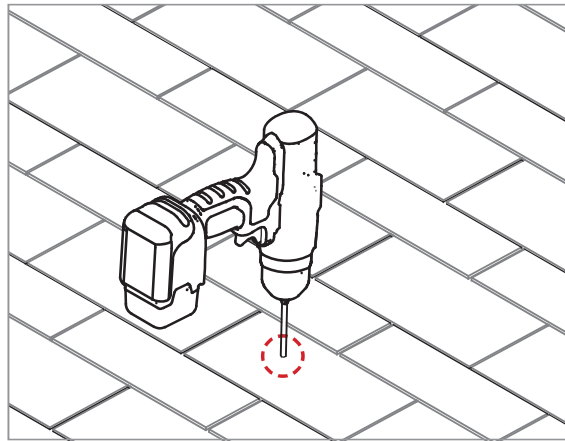
RAIL 20 Attachments

30% LOGISTICS SAVINGS

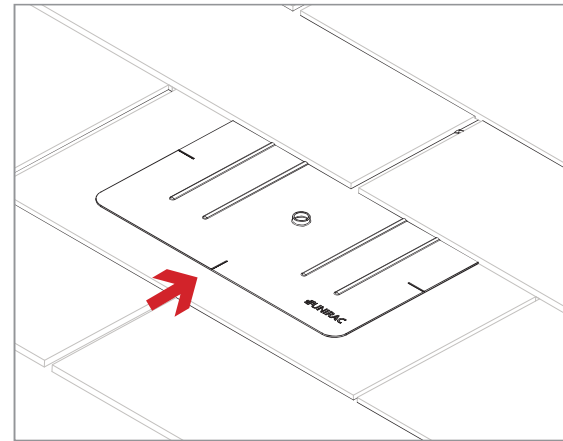
With fewer SKUs and compact components, **SFM INFINITY** is easier to stock, easier to transport, and easier to lift to the roof. Plus, make more efficient use of your vehicle fleet.



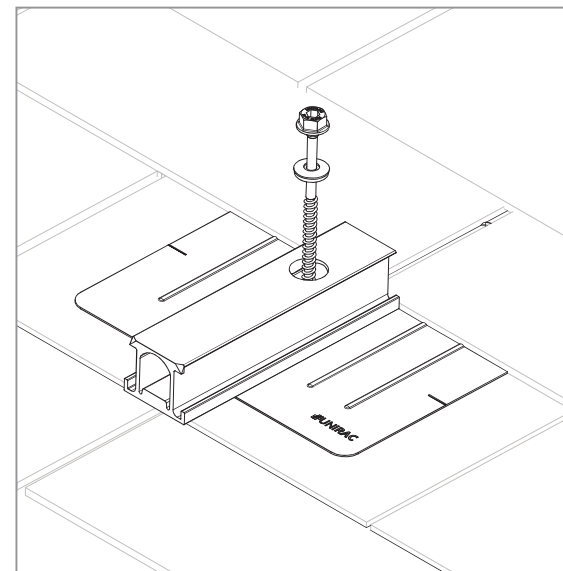
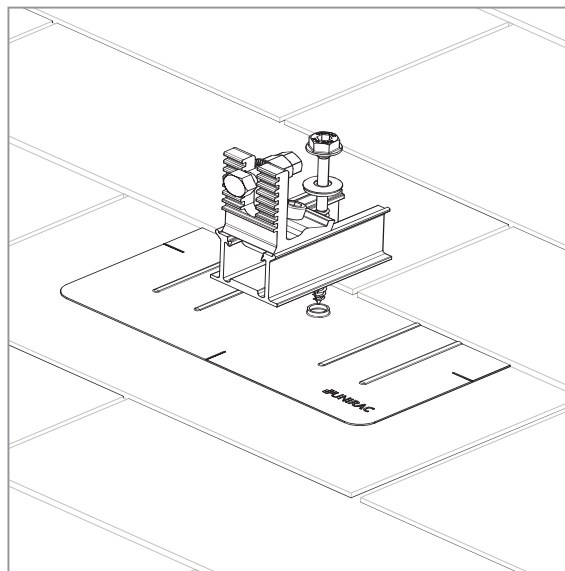
SFM INFINITY REVOLUTIONIZES ROOFTOP SOLAR WITH BENEFITS ACROSS YOUR BUSINESS, FROM DESIGN AND LOGISTICS, THROUGH ARRAY INSTALLATION AND SERVICE.



PILOT HOLES:
Drill pilot holes for lag screws or structural screws (as necessary) at marked attachment points

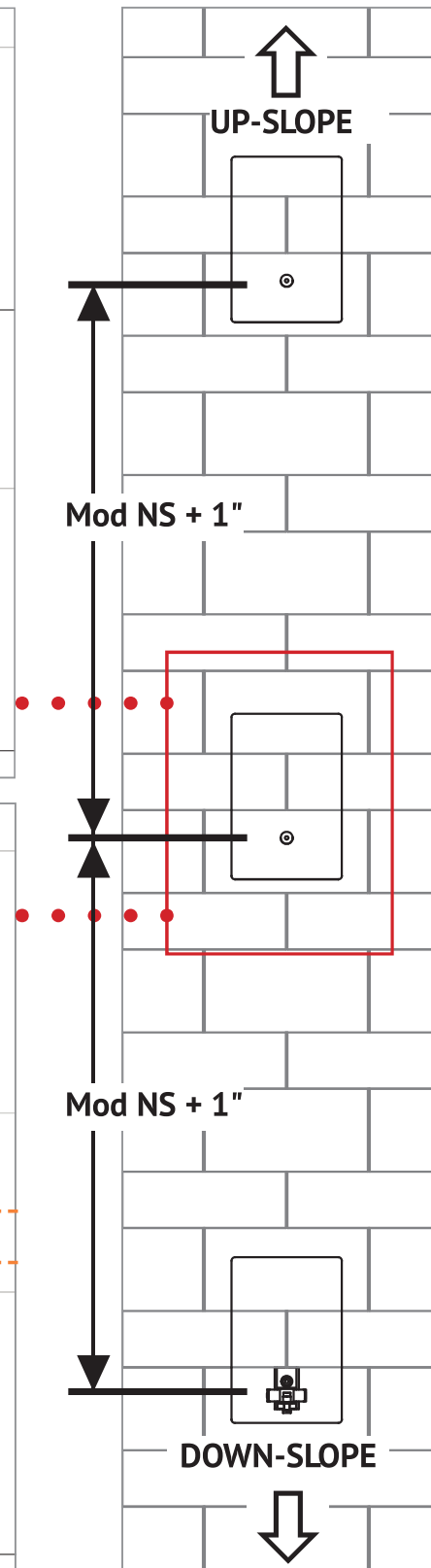
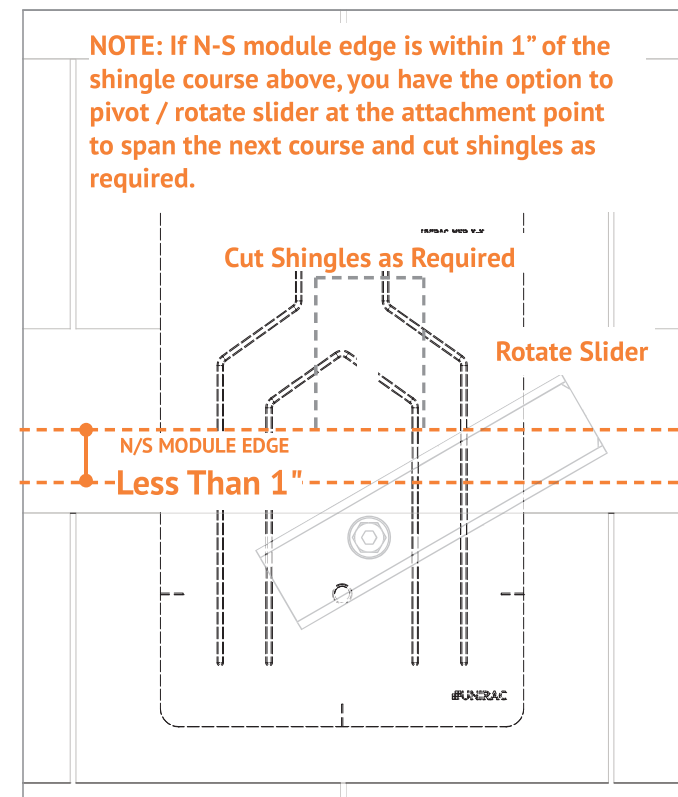
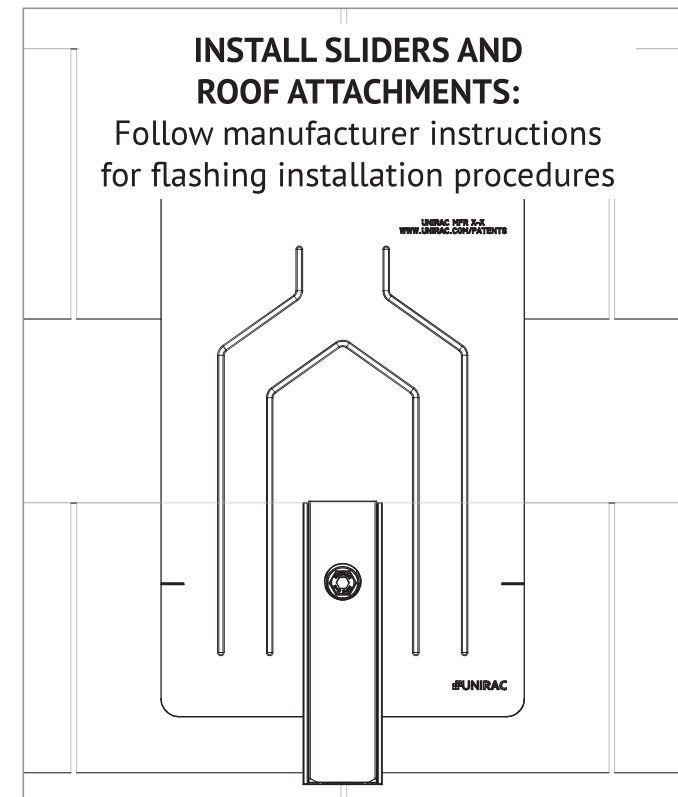


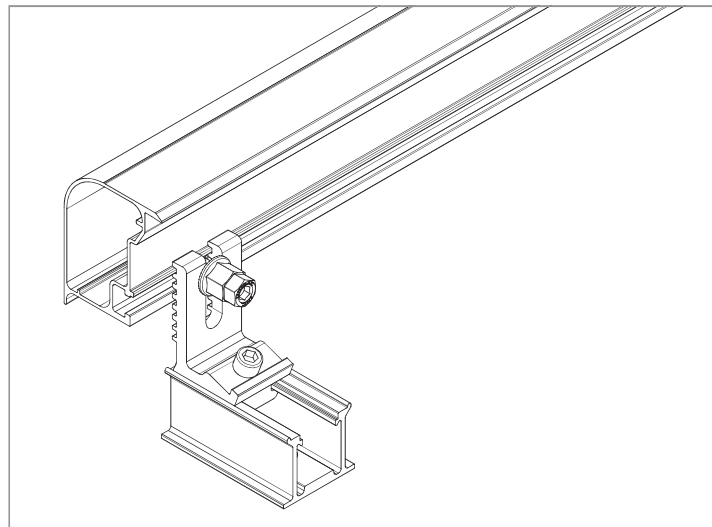
FLASHINGS:
Place flashings



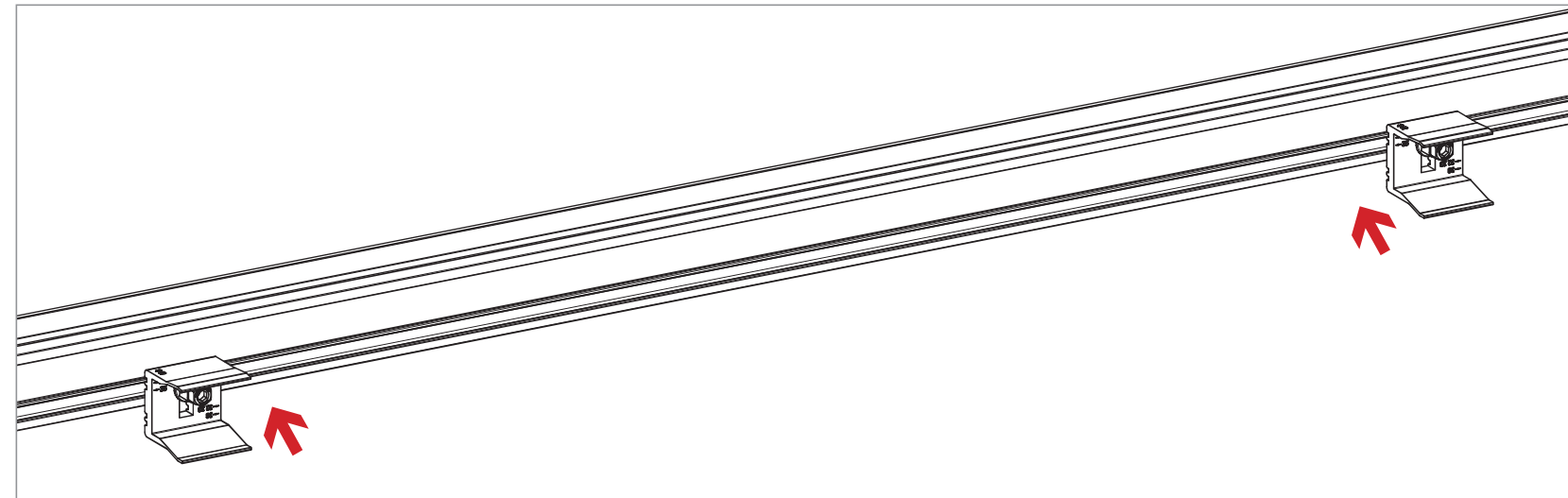
INSTALL SLIDERS AND TRIMRAIL ROOF ATTACHMENTS:

- Insert flashings per manufacturer instructions
- **NOTE: Use Lag screw or structural fastener with a maximum diameter of 5/16"**
- Attach sliders to rafters
- Verify proper row to row spacing for module size (Mod NS + 1")
- Ensure that Trimrail™ roof attachments in each row have sufficient engagement with slider dovetails for proper attachment.



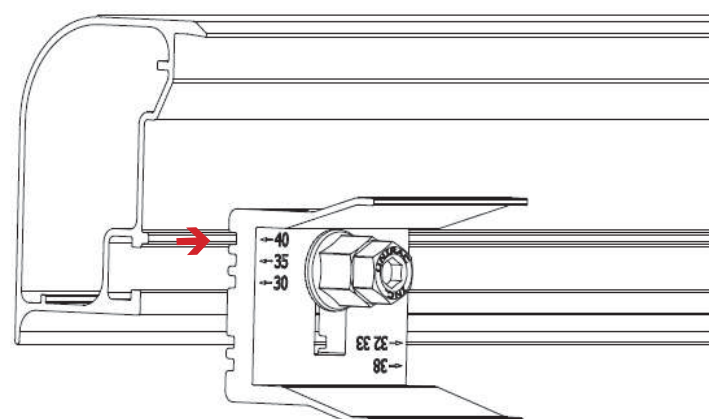


ATTACH TRIMRAIL TO ROOF ATTACHMENT:
Attach rail using 3/8" hex bolt & Tri-drive or serrated flange nuts. Make sure Trimrail™ is level across all Trimrail™ roof attachments. After rail is level, tighten channel clamp bolts to secure Trimrail™ roof attachments to channels.

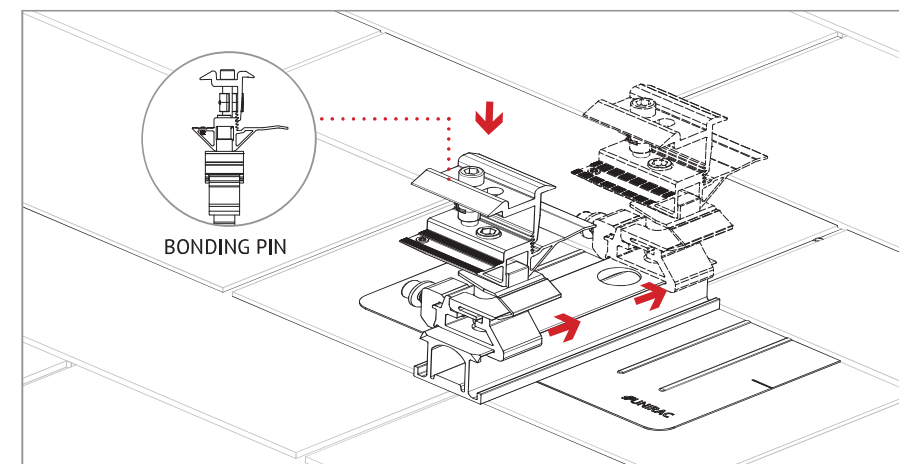
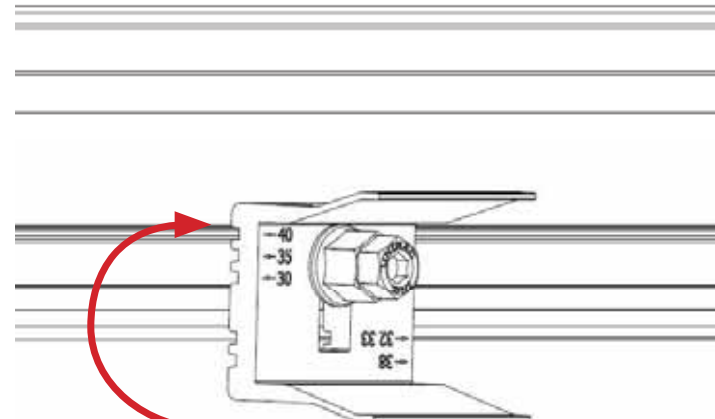


INSTALL MODULE CLIPS ON TRIMRAIL:
Attach module clips to Trimrail using 3/8" T-bolts and Tri-drive or serrated flange nuts. A minimum of two clips are required per module. Refer to SFM D&E guide and U-builder for required position and quantity of module clips.

NOTE: module clips may be pre-installed on trimrail prior to attaching trimrail to roof attachments

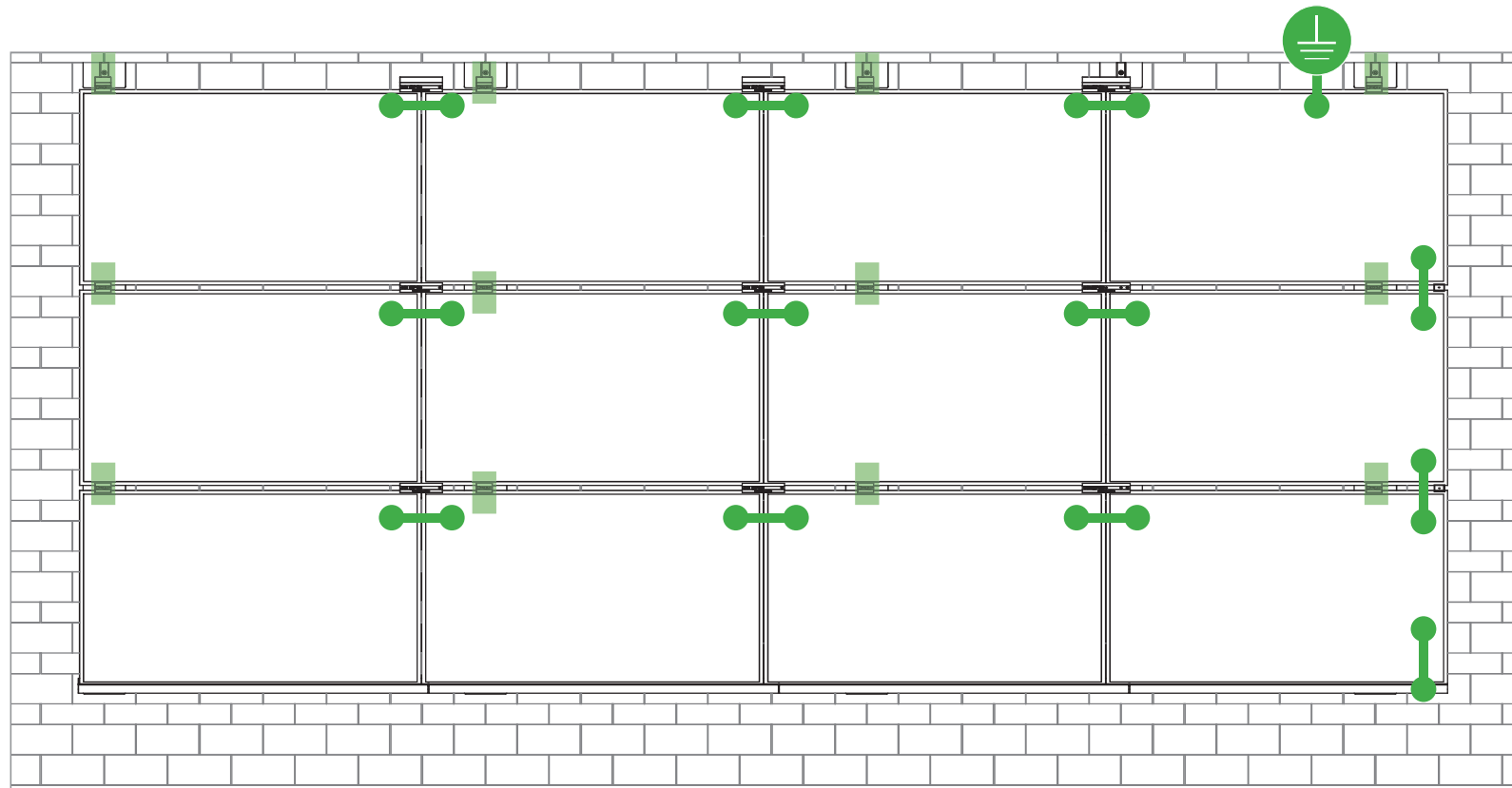


POSITION MODULE CLIPS ACCORDING TO MODULE THICKNESS:
Align notch in module clip with trimrail rib according to module thickness (identified in mm on faces of module clips). Rotate clip to position at required location.



NOTE: Bonding pin on Microrails should be positioned downslope.

INSTALL MICRORAILS:
Install Microrail™ at marked attachment points. Click Microrail™ into sliders and push Microrail™ to top of slider. Ensure that cap remains in upper most (40mm) position.



Star Washer is Single Use Only



TERMINAL TORQUE,
Install Conductor and torque to the following:
4-6 AWG: 35in-lbs
8 AWG: 25 in-lbs
10-14 AWG: 20 in-lbs

LUG DETAIL & TORQUE INFO
IlSCO Lay-In Lug (GBL-4DBT)

- 10-32 mounting hardware
- Torque = 5 ft-lb
- AWG 4-14 - Solid or Stranded

TERMINAL TORQUE,
Install Conductor and torque to the following:
4-14 AWG: 35in-lbs



LUG DETAIL & TORQUE INFO
IlSCO Flange Lug (SGB-4)

- 1/4" mounting hardware
- Torque = 75 in-lb
- AWG 4-14 - Solid or Stranded

WEEBLUG Single Use Only



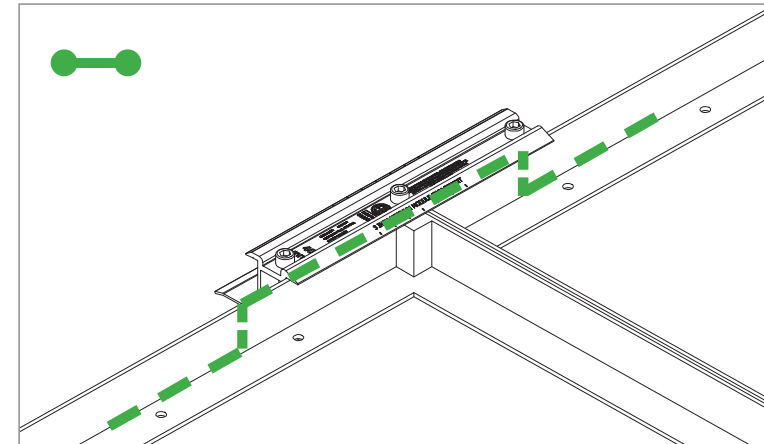
TERMINAL TORQUE,
Install Conductor and torque to the following:
6-14 AWG: 7ft-lbs

LUG DETAIL & TORQUE INFO
Wiley WEEBLug (6.7)

- 1/4" mounting hardware
- Torque = 10 ft-lb
- AWG 6-14 - Solid or Stranded

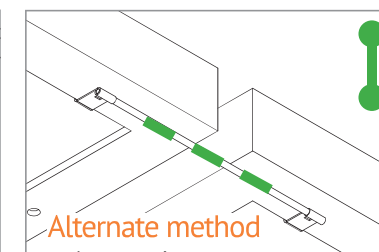
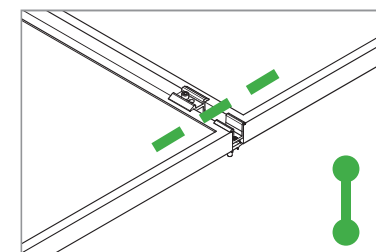
NOTE: ISOLATE COPPER FROM ALUMINUM CONTACT TO PREVENT CORROSION

System bonding is accomplished through modules. System grounding accomplished by attaching a ground lug to any module at a location on the module specified by the module manufacturer.



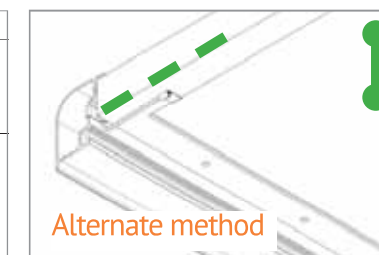
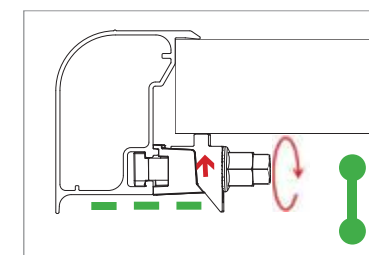
E-W BONDING PATH:

E-W module to module bonding is accomplished with 2 pre-installed bonding pins which engage on the secure side of the Microrail™ and splice.



N-S BONDING PATH:

N-S module to module bonding is accomplished with bonding clamp with 2 integral bonding pins. (refer also to alternate method)



TRIMRAIL BONDING PATH:

Trimrail to module bonding is accomplished with bonding clamp with integral bonding pin and bonding T-bolt. (refer also to alternate method)

SYSTEM LEVEL FIRE CLASSIFICATION

The system fire class rating requires installation in the manner specified in the SUNFRAME MICRORAIL (SFM) Installation Guide. SFM has been classified to the system level fire portion of UL 1703. This UL 1703 classification has been incorporated into the UL 2703 product certification. SFM has achieved Class A, B & C system level performance for low slope & steep sloped roofs when used in conjunction with type 1 and type 2 modules. Class A, B & C system level fire

performance is inherent in the SFM design, and no additional mitigation measures are required. The fire classification rating is valid for any roof pitch. There is no required minimum or maximum height limitation above the roof deck to maintain the Class A, B & C fire rating for SFM. SUNFRAME MICRORAIL™ components shall be mounted over a fire resistant roof covering rated for the application.

Module Type	Roof Slope	System Level Fire Rating	Microrail Direction	Module Orientation	Mitigation Required
Type 1 and Type 2	Steep Slope & Low Slope	Class A, B & C	East-West	Landscape OR Portrait	None Required

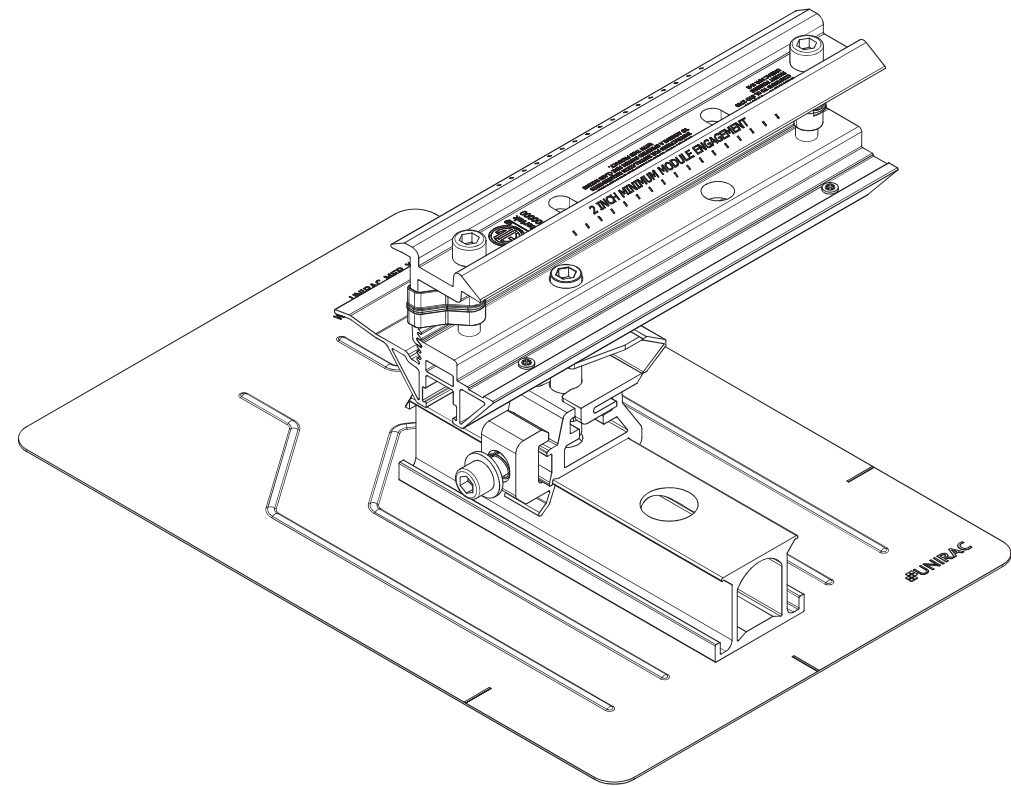
UL2703 TEST MODULES

See pages 22 and 23 for a list of modules that were electrically and mechanically tested or qualified with the SUNFRAME MICRORAIL (SFM) components outlined within this Installation Guide.

- Maximum Area of Module = 27.76 sqft
- UL2703 Design Load Ratings:
 - a) Downward Pressure – 113 PSF / 5400 Pa
 - b) Upward Pressure – 50 PSF / 2400 Pa
 - c) Down-Slope Load – 21.6 PSF / 1034 Pa
- Tested Loads:
 - a) Downward Pressure – 170 PSF / 8000 Pa
 - b) Upward Pressure – 75 PSF / 3500 Pa
 - c) Down-Slope Load – 32.4 PSF / 1550 Pa
- Maximum Span = 6ft
- Use with a maximum over current protection device OCPD of 30A
- System conforms to UL Std 2703, certified to LTR AE-001-2012
- Rated for a design load of 2400 Pa / 5400 Pa with 24 inch span
- PV modules may have a reduced load rating, independent of the SFM load rating. Please consult the PV module manufacturer's installation guide for more information
- Down-Slope design load rating of 30 PSF/ 1400 Pa for module areas of 22.3 sq ft or less

LABEL MARKINGS

- System fire class rating: See installation instructions for installation requirements to achieve a specified system fire class rating with Unirac.
- Unirac SUNFRAME MICRORAIL™ is listed to UL 2703.
- All splices within a system are shipped with marking indicating date and location of manufacture.



Manufacture	Module Model / Series
Aleo	P-Series
Aptos	DNA-120-(BF/MF)26 DNA-144-(BF/MF)26
Astronergy	CHSM6612P, CHSM6612P/HV, CHSM6612M, CHSM6612M/HV, CHSM6610M (BL)(BF)/(HF), CHSM72M-HC
Auxin	AXN6M610T, AXN6P610T, AXN6M612T & AXN6P612T
Axitec	AXIblackpremium 60 (35mm), AXIpower 60 (35mm), AXIpower 72 (40mm), AXIpremium 60 (35mm), AXIpremium 72 (40mm).
Boviet	BVM6610, BVM6612
BYD	P6K & MHK-36 Series
Canadian Solar	CS1(H/K/U/Y)-MS CS3(K/L/U), CS3K-MB-AG, CS3K-(MS/P) CS3N-MS, CS3U-MB-AG, CS3U-(MS/P), CS3W CS5A-M, CS6(K/U), CS6K-(M/P), CS6K-MS CS6P-(M/P), CS6U-(M/P), CS6V-M, CS6X-P
Centrosolar America	C-Series & E-Series
CertainTeed	CT2xxMxx-01, CT2xxPxx-01, CTxxxMxx-02, CTxxxM-03, CTxxxMxx-04, CTxxxHC11-04
Dehui	DH-60M

Manufacture	Module Model / Series
Eco Solargy	Orion 1000 & Apollo 1000
ET Solar	ET-M672BHxxTW
Freedom Forever	FF-MP-BBB-370
FreeVolt	Mono PERC
GCL	GCL-P6 & GCL-M6 Series
Hansol	TD-AN3, TD-AN4, UB-AN1, UD-AN1
Heliene	36M, 60M, 60P, 72M & 72P Series, 144HC M6 Monofacial/ Bifacial Series, 144HC M10 SL Bifacial
HT Solar	HT60-156(M) (NDV) (-F), HT 72-156(M/P)
Hyundai	KG, MG, TG, RI, RG, TI, MI, HI & KI Series HiA-SxxxHG
ITEK	iT, iT-HE & iT-SE Series
Japan Solar	JPS-60 & JPS-72 Series
JA Solar	JAP6 60-xxx, JAM6-60-xxx/SI, JAM6(K)-60/ xxx, JAP6(k)-72-xxx/4BB, JAP72SYY-xxx/ZZ, JAP6(k)-60-xxx/4BB, JAP60SYY-xxx/ZZ, JAM6(k)-72-xxx/ZZ, JAM72SYY-xxx/ZZ, JAM6(k)-60-xxx/ZZ, JAM60SYY-xxx/ZZ. i. YY: 01, 02, 03, 09, 10 ii. ZZ: SC, PR, BP, HiT, IB, MW, MR
Jinko	JKM & JKMS Series Eagle JKMxxxM JKMxxxM-72HL-V
Kyocera	KU Series

Manufacture	Module Model / Series	
LG Electronics	LGxxxN2T-A4 LGxxx(A1C/E1C/E1K/N1C/N1K/N2T/N2W/ Q1C/Q1K/S1C/S2W)-A5 LGxxxN2T-B5 LGxxxN1K-B6 LGxxx(A1C/M1C/M1K/N1C/N1K/Q1C/Q1K/ QAC/QAK)-A6 LGxxx(N1C/N1K/N2T/N2W)-E6 LGxxx(N1C/N1K/N2W/S1C/S2W)-G4 LGxxxN2T-J5 LGxxx(N1K/N1W/N2T/N2W)-L5 LGxxx(N1C/Q1C/Q1K)-N5 LGxxx (N1C/N1K/N2W/Q1C/Q1K)-V5	
	LR4-60(HIB/HiH/HPB/HPH)-xxxM LR4-72(HiH/HPH)-xxxM LR6-60(BP/HBD/HIBD)-xxxM (30mm) LR6-60(BK)(PE)(HPB)(HPH)-xxxM (35mm) LR6-60(BK)(PE)(PB)(PH)-xxxM (40mm) LR6-72(BP)(HBD)(HIBD)-xxxM (30mm) LR6-72(HV)(BK)(PE)(PH)(PB)(HPH)-xxxM (35mm) LR6-72(BK)(HV)(PE)(PB)(PH)-xxxM (40mm)	
	Mission Solar Energy	MSE Series
	Mitsubishi	MJE & MLE Series
	Neo Solar Power Co.	D6M & D6P Series

- Unless otherwise noted, all modules listed above include all wattages and specific models within that series. Variable wattages are represented as "xxx"
- Items in parenthesis are those that may or may not be present in a compatible module's model ID
- Slashes "/" between one or more items indicates that either of those items may be the one that is present in a module's model ID
- Please see the SFM UL2703 Construction Data Report at Unirac.com to ensure the exact solar module selected is approved for use with SFM
- SFM Infinity is not compatible with module frame height of less than 30mm and more than 40mm. See Module Mounting section, page 12 for further information

Manufacture	Module Model / Series
Panasonic	EVPVxxx (H/K/PK), VBHNxxxSA15 & SA16, VBHNxxxSA17 & SA18, VBHNxxxSA17(E/G) & SA18E, VBHNxxxKA01 & KA03 & KA04, VBHNxxxZA01, VBHNxxxZA02, VBHNxxxZA03, VBHNxxxZA04
Peimar	SGxxxM (FB/BF)
Phono Solar	PS-60, PS-72
Prism Solar	P72 Series
Q.Cells	Plus, Pro, Peak, G3, G4, G5, G6(+), G7, G8(+) Pro, Peak L-G2, L-G4, L-G5, L-G6, L-G7 Q.PEAK DUO BLK-G6+ Q.PEAK DUO BLK-G6+/TS Q.PEAK DUO (BLK)-G8(+) Q.PEAK DUO L-G8.3/BFF Q.PEAK DUO (BLK) ML-G9(+) Q.PEAK DUO XL-G9/G9.2/G9.3 Q.PEAK DUO (BLK) ML-G10(+) Q.PEAK DUO XL-G(10/10.2/10.3/10.c/10.d) Q.PEAK DUO BLK ML-G10+ / t
REC Solar	Alpha (72) (Black) (Pure) RECxxxAA PURE-R RECxxxNP3 Black N-Peak (Black) N-Peak 2 (Black) PEAK Energy Series PEAK Energy BLK2 Series PEAK Energy 72 Series

Manufacture	Module Model / Series
REC Solar (cont.)	TwinPeak Series TwinPeak 2 Series TwinPeak 2 BLK2 Series TwinPeak 2S(M)72(XV) TwinPeak 3 Series (38mm) TP4 (Black)
Renesola	Vitrus2 Series & 156 Series
Risen	RSM72-6 (MDG) (M), RSM60-6
SEG Solar	SEG-xxx-BMD-HV SEG-xxx-BMD-TB
S-Energy	SN72 & SN60 Series (40mm)
Seraphim	SEG-6 & SRP-6 Series
Sharp	NU-SA & NU-SC Series
Silfab	SLA, SLG, BC Series & SILxxx(BL/NL/NT/HL/ML/BK/NX/NU/HC)
Solarever USA	SE-166*83-xxxM-120N
Solaria	PowerXT-xxxR-(AC/PD/BD) PowerXT-xxxC-PD PowerXT-xxxR-PM (AC)
SolarWorld	Sunmodule Protect, Sunmodule Plus
Sonali	SS-M-360 to 390 Series, SS-M-390 to 400 Series, SS-M-440 to 460 Series, SS-M-430 to 460 BiFacial Series, SS 230 - 265
SunEdison	F-Series, R-Series & FLEX FXS Series

Manufacture	Module Model / Series
Suniva	MV Series & Optimus Series
SunPower	A-Series A400-BLK , SPR-MAX3-XXX-R, X-Series, E-Series & P-Series
Suntech	STP, STPXXXS - B60/Wnhb
Talesun	TP572, TP596, TP654, TP660, TP672, Hipor M, Smart
Tesla	SC, SC B, SC B1, SC B2 TxxxH, TxxxS
Trina	PA05, PD05, DD05, DE06, DD06, PE06, PD14, PE14, DD14, DE09.05, DE14, DE15, PE15H
Upsolar	UP-MxxxP(-B), UP-MxxxM(-B)
United Renewable Energy (URE)	D7MxxxH7A, D7(M/K)xxxH8A FAKxxx(C8G/E8G), FAMxxxE7G-BB FAMxxxE8G(-BB) FBMxxxMFG-BB
Vikram	Eldora, Solivo, Somera
Waaree	AC & Adiya Series
Winaico	WST & WSP Series
Yingli	YGE & YLM Series
ZN Shine	ZXM6-72, ZXM6-NH144-166_2094

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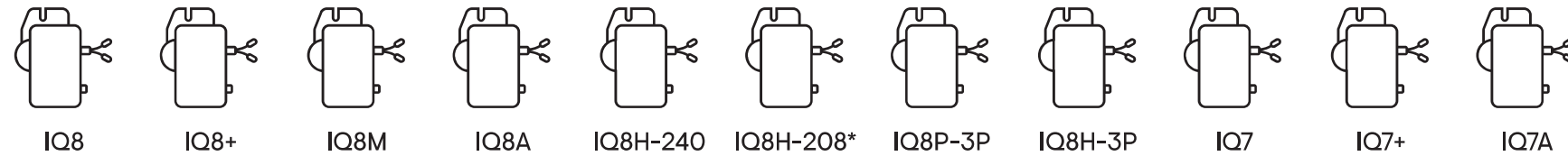
**PV INSTALLATION
PROFESSIONAL**

Scott Gurney
#PV-011719-015866

CONTRACTOR:
BRS FIELD OPS
385-498-6700

Temperature range

RECORD LOW RECORD HIGH
-27 - 34 °C



* IQ8H-208 support split phase, 208V only.

SEG-400-BMD-HV



✓ Compatible (✗) Not compatible

Notice

Modules paired with Enphase microinverters with Integrated Ground must use PV Wire or PV Cable that is compliant with NEC 690.35(D) for Ungrounded PV Power Systems. When using this solar panel calculator, do not connect an Enphase microinverter to a module that the calculator indicates is incompatible. Doing so may void the warranty. This calculator only shows the compatibility of the modules with Enphase microinverters and doesn't provide any information on clipping that may occur due to sizing and other DC parameters of the PV module. Enphase IQ Series microinverters are compatible with bi-facial PV modules if the temperature adjusted electrical parameters (maximum power, voltage and current) of the modules, considering the electrical parameters including the Bifacial gain, are within the allowable microinverter input parameters range. In evaluating the amount of Bifaciality gain, follow the recommendations of the module manufacturers.

V2-NA-EN-08-18

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PROGRESS LETTER REPORT

9/27/22

Report No. 105140118LAX-001b
Intertek Project No. G105140118

Klaus Nicolaedis
Unirac Inc.
1411 Broadway Blvd NE
Albuquerque, NM 87102-1545
USA

Subject:
SUN Update for three existing reports of 102675852LAX-001(Bonding Clip), 102393982LAX-002 (SFM) and 102675852LAX-002 (MLPE Mount) and addition of PV module to SFM report

Dear Klaus,

This letter report represents the result of the construction evaluation of the SUN letter and PV module addition to the requirements contained in the following standards:

Mounting Systems, Mounting Devices, Clamping/Retention Devices, and Ground Lugs for Use with Flat-Plate Photovoltaic Modules and Panels [UL 2703:2015 Ed.1+R:24Mar2021]]

**SECTION 1
SUMMARY**

The scope of this project was to perform an evaluation for SUN update that is standard update from May 2019 revision to 2021 and 7 PV module addition. 3 additional module manufacturers were requested and evaluated at the same time. This project, G1051408118 was authorized by quote Qu-01275837-3 dated July 15, 2022.

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UNIRAC, INC.

PROGRESS LETTER REPORT

SCOPE OF WORK

SUN Update for three existing reports of 102675852LAX-001(Bonding Clip), 102393982LAX-002 (SFM) and 102675852LAX-002 (MLPE Mount) and addition of PV modules to SFM report

REPORT NUMBER:

105140118LAX-001b

ISSUE DATE

09/27/22

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**PV INSTALLATION
PROFESSIONAL**

Scott Gurney
#PV-011719-015866

**CONTRACTOR:
BRS FIELD OPS
385-498-6700**

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PROGRESS LETTER REPORT

SECTION 2
S.U.N. CONSTRUCTION EVALUATION to UL 2703

UL2703 REVISION MARCH 24 TH , 2021 EVALUATION			
CLAUSE	VERDICT	COMMENT	EVALUATION
9	INFO	BONDING	
9.2	New Manual needed	Routine maintenance of a PV module or mounting system, e. g. inspection or cleaning, shall not involve breaking or disturbing the bonding path of the system. If the removal of a module may break or disrupt the bonding path of the system, the installation manual shall comply with 26.10.	Update the instructions, it either: 1. Needs to be clear removing 1 module cannot break bonding path to grounding lug for multiple modules 2. Needs to comply with 26.10 below
26.10	New Manual needed	For a system where the removal of a module may break or disrupt the bonding path of the system (see 9.2), the installation manual shall comply with all of the following: a) Module removal is not presented as a frequently expected occurrence and will not be required as part of routine maintenance. b) Include the following statement, or equivalent: "CAUTION: Module removal may disrupt the bonding path and could introduce the risk of electric shock. Additional steps may be required to maintain the bonding path. Modules should only be removed by qualified persons in compliance with the instructions in this manual." c) Scenarios that could result in a disruption of the bonding path are described, for example irregularly-shaped arrays, arrays consisting of individual rows, and any other scenario where module removal could disrupt the bonding path. d) Instructions for maintaining a complete bonding path when modules are removed.	b) Please add b) compliance "CAUTION:..." quote c) Please comply with C, the methods and actions are left to you. d) Please provide item d on the user manual

PROGRESS LETTER REPORT

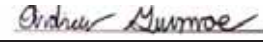

The following PV Modules can be added to the system:

Model Name	Verdict	Comment (full added models)
Freedom Forever	Pass	FF-MP-BBB-370
Heliene	Pass	144HC M6 Monofacial and Bifacial, 144HC M10 SL Bifacial
Panasonic	Pass	EVPV 350 PK, EVPVxxx 360, 370, EVPVxxx 370, 380, EVPVxxxH 400, 410, EVPVxxxK 350, 360, EVPVxxxK 360, 370, EVPVxxxPK 360, 370
SEG	Pass	SEG-XXX-BMD-HV
SolarEver	Pass	SE-166_83-xxxM-120N
Sonali	Pass	SS-M Bi Facial 144 Cell, SS-M-360 to 390 Series, SS-M-390 to 400 Series, SS-M-440 to 460 Series
(Wuxi) Suntech	Pass	STPXXXS - B60/Wnhb
Sunpower (Maxeon)	Pass	A-Series A400-BLK, SPR-MAX3-XXX-R
Tesla	Pass	TxxxH
ZN Shine	Pass	ZXM6-NH144-166_2094

SECTION 3
PROJECT STATUS & ACTION

Issuance of this letter report provides status of construction evaluation covered by Intertek Project G105140118. To complete the update INTERTEK needs a new instruction manual. No more information or details are needed to complete the addition of PV models to the listings. Please provide an updated manual.

If there are any questions regarding the results contained in this report, or any of the other services offered by Intertek, please do not hesitate to contact your dedicated Intertek Project Manager.

Completed by:	Andrew Gunnoe	Reviewed by:	Abhinav Prakash
Title:	Project Engineer	Title:	Reviewer
Signature:		Signature:	
Date:	09/27/22	Date:	09/27/22

Please note: this Letter Report does not represent authorization for the use of any Intertek certification marks.

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PV INSTALLATION PROFESSIONAL
Scott Gurney
#PV-011719-015866

CONTRACTOR:
BRS FIELD OPS
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